



ENVIRONMENTAL SOURCE SAMPLERS, INC. – AIR QUALITY CONSULTANTS

**HONEYWELL INTERNATIONAL, INC.
HOPEWELL PLANT
AREA 9 C-TRAIN: TW-18 INLET/OUTLET
PART 60 CEMS RATAS AND
NOX REDUCTION EFFICIENCY
APRIL 20, 2015 & MAY 11, 2015**

ESS PROJECT NO. 0115-26

**Prepared for:
Honeywell International, Inc. – Hopewell Plant
905 E. Randolph Road
Hopewell, Virginia**

**Prepared by:
Environmental Source Samplers, Inc.
436 Raleigh Street, Suite B
Wilmington, North Carolina 28412**

CERTIFICATION

This test report is submitted to Honeywell International, Inc. by Environmental Source Samplers, Inc., covering air emissions sampling conducted at the Honeywell International, Inc. Hopewell, Virginia facility on April 20 and May 11, 2015. ESS operated within the requirements of ASTM D7036-04 during the test project. The data and results presented in this report are representative of the actual operating and test parameters.

Analytical reports are reviewed for completeness, accuracy, adherence to method protocol, and compliance with quality assurance guidelines and NELAC 2003 standards. The results relate only to the laboratory samples listed. Neither this certification nor report shall be reproduced except in full, without written approval of ESS. ESS laboratory (VELAP ID: 460039) is accredited through the Virginia Environmental Laboratory Accreditation Program (VELAP) for methods pertaining to filterable particulate matter, sulfuric acid, total reduced sulfur and hydrogen sulfide. ESS only subcontracts to laboratories with NELAP accreditation. All test results provided meet all requirements of NELAP unless labeled otherwise. Justification will be provided in Appendix D for all results that do not meet NELAP requirements. Certificates of Accreditation are available upon request.

Results Reviewed By:



Melanie Bethea, Operations Manager
June 9, 2015

Report Reviewed and Finalized By:



Mark Looney, President
June 9, 2015



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Environmental Source Samplers, Inc.

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SECTION 1 INTRODUCTION



1.0 INTRODUCTION

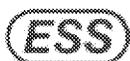
Environmental Source Samplers, Inc. (ESS) conducted air emissions sampling at the Honeywell - Hopewell Plant, located in Hopewell, Virginia. NO_x reduction efficiency was determined while conducting a Relative Accuracy Test Audits (RATA) on Continuous Emission Monitoring Systems (CEMS) associated with process TW-18 outlet stack on April 20, 2015. The inlet was sampled simultaneously for NO_x emissions.

A Relative Accuracy Test Audit (RATA) was on Continuous Emission Monitoring Systems (CEMS) associated with process TW-18 inlet stack on May 11, 2015.

The test series was conducted in accordance with 40 CFR Part 60 procedures. U.S. Environmental Protection Agency (EPA) Methods 7e and 3a, appearing in 40 CFR Part 60, Appendix A, were used to perform this gas sampling. EPA Methods 1 – 4 were used in conducting the moisture and flowrate measurements. Performance Specifications 2 and 6, appearing in 40 CFR Part 60, Appendix B, were also incorporated into the test series, as required.

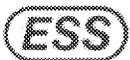
Personnel present included:

- Mr. Tom Varner, Honeywell International, Inc.
- Mr. Robert Affalter, Honeywell International, Inc.
- Mr. Charles Garner, QSTI, Environmental Source Samplers, Inc.
- Mr. Tiberiu Munteanu, QSTI, Environmental Source Samplers, Inc.
- Mr. Richard Sitter QSTI, Environmental Source Samplers, Inc.
- Mr. Jeffery Turner, Environmental Source Samplers, Inc.
- Mr. John Reid, Environmental Source Samplers, Inc.
- Mr. Andre Johnson, Environmental Source Samplers, Inc.



SECTION 2

SUMMARY OF RESULTS



2.0 SUMMARY OF RESULTS

The test results are summarized below and detailed more completely on the following pages. Field data sheets are included in Appendix A, calculations in Appendix B, operational data in Appendix C, and calibration data in Appendix D.

Nine (9) or ten (10) runs were conducted at a single load condition for the parameters of interest. Part 60 requirements for NO_x and flowrate monitors are 20 percent relative accuracy to meet the applicable Performance Specification requirements (PS 2, section 13.2 and PS 6, section 13.2).

Unit TW-18 Inlet– CEMS Summary Table

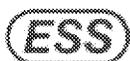
PARAMETER	CEM RA (%)
A- CEMS NO _x (ppm)	4.82
B-CEMS NO _x (ppm)	9.83

Unit TW-18 Outlet – CEMS Summary Table

PARAMETER	CEM RA (%)
Flowrate (SCFM)	16.82
NO _x (ppm)	16.67

Unit TW-18 – NO_x Destruction Efficiency – April 20, 2015 Test Summary

PARAMETER	EMISSIONS
Inlet NO _x (lb/hr)	292.55
Outlet NO _x (lb/hr)	0.63
Destruction Efficiency (%)	99.8



HONEYWELL - HOPEWELL, VA
 RELATIVE ACCURACY -TW-18 OUTLET
 April 20, 2015

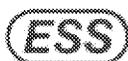
NOX (PPM)

RUN NO.	TEST	MONITOR	DIFFERENCE	%
1	4.90	4.26	0.64	13.03
2	5.00	4.02	0.98	19.60
3	3.93	3.50	0.43	11.01
4	4.98	4.31	0.67	13.51
5	5.19	4.31	0.88	17.01
6	5.16	4.32	0.84	16.30
7	5.29	4.54	0.75	14.26
8	5.56	4.90	0.66	11.89
9	5.70	5.07	0.63	11.04
AVG	5.08	4.36	0.72	14.18
MEAN OF DIFFERENCE			0.72	
STANDARD DEVIATION			0.16	
2.5% ERROR CONFIDENCE			0.13	
RELATIVE ACCURACY (%)			16.67	

HONEYWELL - HOPEWELL, VA
 RELATIVE ACCURACY -TW-18 OUTLET
 April 20, 2015

NOX (LB/HR)

RUN NO.	TEST	MONITOR	DIFFERENCE	%
1	0.60	0.62	-0.02	-3.23
2	0.62	0.59	0.03	4.87
3	0.49	0.51	-0.02	-3.37
4	0.59	0.63	-0.04	-6.62
5	0.63	0.64	-0.01	-2.08
6	0.65	0.63	0.02	3.49
7	0.64	0.67	-0.03	-4.86
8	0.70	0.72	-0.02	-2.63
9	0.73	0.75	-0.02	-3.44
AVG	0.63	0.64	-0.01	-1.99
MEAN OF DIFFERENCE			0.01	
STANDARD DEVIATION			0.02	
2.5% ERROR CONFIDENCE			0.02	
RELATIVE ACCURACY (%)			4.81	



**HONEYWELL
DETERMINATION OF FLOWRATE - RESULTS
TW-18 OUTLET**

FIELD DATA

Date	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	Average
Run Number	1	2	3	4	5	6	7	8	9	9	9	9	9
Run Start Time	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	15:00	15:00	15:30	hh:mm
Run Stop Time	11:50	12:20	12:50	13:20	13:50	14:20	14:50	15:20	15:50	15:20	15:20	15:50	hh:mm
Meter Calibration Factor (Y)	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	
Pitot Tube Coefficient (C _p)	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	
Total Meter Volume (V _m)	21.162			21.137			21.125			21.125			ft ³
Total Sampling Time (t)	30.0			30.0			30.0			30.0			min
Average Meter Temperature (t _m) _{avg}	69.8			77.2			76.3			76.3			°F
Average Stack Temperature (t _s) _{avg}	530.4	523.6	531.6	524.4	531.3	528.9	531.3	522.6	507.8	522.6	507.8	525.77	°F
Absolute Stack Pressure (P _s)	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	29.73	in Hg
Average Sample Rate	1.50			1.50			1.50			1.50			dscfm
Avg Square Root Pitot Pressure (Δp ^{1/2}) _{avg}	1.018	1.035	1.067	0.950	0.992	1.066	0.992	1.074	1.076	1.074	1.076	1.03	(in H ₂ O) ^{1/2}

MOISTURE CONTENT DATA

Parameter	1	2	3	4	5	6	7	8	9	Average
Total Water Volume Collected (V _w)	8.1	8.1	8.1	9.1	9.1	9.1	9.1	9.1	9.1	8.8
Standard Water Vapor Vol (V _w) _{std}	0.382	0.382	0.382	0.429	0.429	0.429	0.429	0.429	0.429	0.414
Standard Meter Vol (V _m) _{std}	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.776
Stack Moisture Content (B _w)	1.79	1.79	1.79	2.01	2.01	2.01	2.04	2.04	2.04	1.95

GAS ANALYSIS DATA

Run Number	1	2	3	4	5	6	7	8	9
Carbon Dioxide Percentage (%CO ₂)	5.1	5.2	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Oxygen Percentage (%O ₂)	4.6	4.6	4.7	4.7	4.6	4.6	4.7	4.7	4.7
Carbon Monoxide Percentage (%CO)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrogen Percentage (%N ₂)	90.3	90.2	90.2	90.2	90.3	90.3	90.2	90.2	90.2
Dry Gas Molecular Wt (M _d)	29.00	29.02	29.00	29.00	29.00	29.00	29.00	29.00	29.00
Wet Stack Gas Molecular Wt (M _w)	28.98	29.00	28.98	28.96	28.96	28.96	28.96	28.96	28.96
Calculated Fuel Factor (F _d)	3.196	3.135	3.176	3.176	3.196	3.196	3.176	3.176	3.176
Percent Excess Air (%EA)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

VOLUMETRIC FLOW RATE DATA

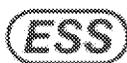
Parameter	1	2	3	4	5	6	7	8	9	Average
Average Stack Gas Velocity (V _g)	77.57	77.93	79.45	74.72	76.61	80.07	76.61	79.38	78.84	77.91
Stack Cross-Sectional Area (A _s)	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07
Actual Stack Flow Rate (Q _a)	32899	33050	33696	31690	32490	33957	32490	33666	33436	33042
Wet Standard Stack Flow Rate (Q _{sw})	17428	17630	17930	16890	17196	18016	17196	17977	18128	17568
Dry Standard Stack Flow Rate (Q _d)	17116	17314	17510	16551	16851	17654	16845	17609	17757	17245

CEMS DATA

Wet Standard Stack Flow Rate	20,140	20,175	20,221	20,256	20,244	20,112	20,183	20,255	20,242	20,203
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RELATIVE ACCURACY TEST DATA

Parameter	1	2	3	4	5	6	7	8	9
Difference	-2712	-2545	-2392	-3368	-3048	-2086	-2987	-2278	-2115
Percent Difference	-15.56	-14.44	-13.41	-19.94	-17.73	-11.64	-17.37	-12.67	-11.67
Standard Deviation									
2.5% Error Confidence									
T-Value									
BAF									
Relative Accuracy									



SECTION 3 PROCESS DESCRIPTION



3.0 PROCESS DESCRIPTION AND OPERATION

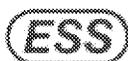
The Honeywell – Hopewell Plant is the world’s largest single-site producer of caprolactam. Additionally, the facility produces ammonium sulfate, specialty polymers and other proprietary chemicals.

Source testing consisted of the “AREA 9” production unit. Area 9 provides components of the caprolactam, ammonium sulfate, and specialty products produced by the Hopewell Plant. The Area 9 source tested was the Disulfonate section of “C” Train (TW-18). Testing of the Area 9 stacks is required in order to meet the monitoring requirements outlined in the facility Title V Permit (Condition 74) issued on October 1, 2014. Process rates for the tested Area 9 sources were greater than 50% of each unit’s capacity during the test period.

A CEMS is located at the inlet and outlet stack sampling locations – as previously delineated. Each CEMS unit is designed to monitor flowrate (KWSCFH or KSCFM, as noted) and NO_x (ppm-wet).

CEM manufacturers, model numbers and serial numbers have previously been provided to the VADEQ-DAQ.

CEMS and process operating data appear in Appendix C to this report.



SECTION 4

SAMPLING POINT LOCATION



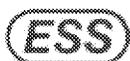
4.0 SAMPLING LOCATION

Each process unit directs their process emissions to dedicated emission points.

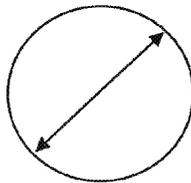
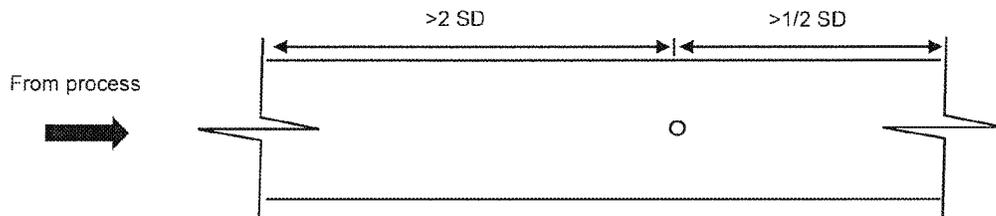
For TW-18 Inlet CEMS, the stack sampling plane is located in a thirty-two (32) inch diameter cross-section. In accordance with Performance Specification 2 and 3 procedures, a three (3) point traverse was conducted during each test run. Each point was sampled for 7.0 minutes, resulting in 21.0 minute test runs.

The TW-18 Outlet CEMS sampling plane is located in a thirty-six (36) inch diameter cross-section. The test ports are located greater than 360 inches downstream of a duct disturbance and more than 180 inches upstream of a duct bend. For the purpose of measuring stack gas velocity, twelve (12) points were sampled.

Diagrams of the sampling locations appear on the following pages.



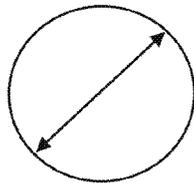
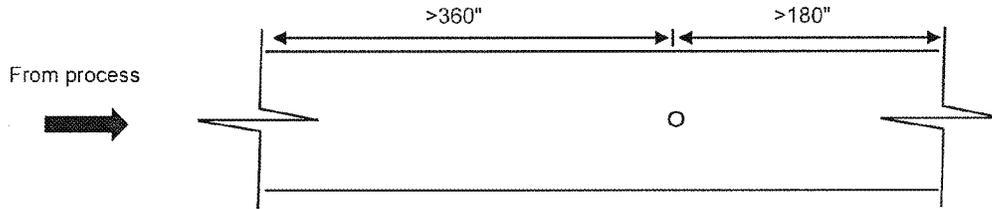
HONEYWELL INTERNATIONAL
HOPEWELL, VIRGINIA
TW-18 DISULFONATE TOWER INLET SAMPLING PLANE
(INLETS A & B SIMILAR)



Stack Diameter = 32 "

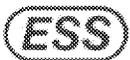


HONEYWELL INTERNATIONAL
 HOPEWELL, VIRGINIA
 TW-18 DISULFONATE TOWER OUTLET SAMPLING PLANE



Stack Diameter = 36 "

Dist from inside stack wall to point	
1	34.4 "
2	30.7 "
3	25.3 "
4	10.7 "
5	5.3 "
6	1.6 "



SECTION 5

FIELD & ANALYTICAL PROCEDURES



5.0 FIELD AND ANALYTICAL PROCEDURES

Gaseous Emission Testing

The extractive monitoring system and all sampling and analysis procedures used in this testing program conform with the requirements of 40 CFR 60, Appendix A, reference methods 3a and 7e. For O₂, CO₂ and NO_x sampling, the gas sample was extracted through a heated stainless steel sample probe having an in-stack filter. A heated teflon lined sample line delivered the gas sample from the heated probe to the VIA MAK II gas condensing unit. The sample was then directed through an un-heated teflon sample line to the sample pump and gas manifold, where the appropriate flowrate for each analyzer was set and the sample gas delivered to the analyzers. An Omega Data Acquisition System (DAS) recorded the data at each of the sampling points, and provided averages for each test run. The DAS was capable of handling eight (8) channels. During this test series, three (3) channels were used to record O₂, CO₂ and NO_x.

EPA Protocol calibration gases were used to calibrate the instruments according to the applicable EPA methodology. The O₂, CO₂ and NO_x calibration gases have been analyzed according to EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards, September, 1993 and as amended by EPA 600/R-12/531 on June 29, 2012.

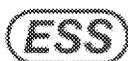
NO_x Analyzer

An API Model 200AH analyzer (S/N 192) was used to collect the NO_x data. This monitor uses chemiluminescence in determining NO or NO_x concentrations. NO_x is defined as the sum of the NO and NO₂ gas concentrations. In the determination of NO, the sample is converted to NO₂ through association with ozone generated by the analyzer. A highly sensitive photomultiplier detector tube measures the light emitted by the photon emission. For the determination of NO_x, the sample is directed to the reaction chamber, where the NO₂ is dissociated to form NO via the NO₂ to NO converter. The remainder of the analysis is then as described above through reaction with the ozone.

O₂ Analyzer

Oxygen was monitored with a California Analytical Instruments Model 200 Paramagnetic Oxygen Analyzer (PMA). The PMA cell consists of a dumbbell of diamagnetic material, which is temperature controlled electronically at 50 degrees C. The higher the oxygen concentration, the farther the dumbbell is deflected from its rest position. Surrounding the dumbbell is a coil of wire. A current is passed through this coil to return the dumbbell to its original position. The current applied is linearly proportional to the percent oxygen concentration in the sample gas.

Since the instrument is based on the magnetic property of oxygen (and unaffected by coexisting gas components), it is optimum for use in combustion type applications and for environmental control.



CO₂ Analyzer

A CAI Model 3300A non-dispersive infrared (NDIR) analyzer (S/N N3P1278T) was used in determining CO₂ concentrations. An infrared light beam emitted by the source passes through the measuring cell, which is filled with a continuously flowing gas sample. The light beam is partially absorbed by the CO₂ in the cell before reaching the front chamber of the detector. The difference in the amount of light absorbed between the front and rear chambers is dependent on the concentration of the CO₂ within the sample measurement cell. The pressure difference between the two (2) chambers is monitored by the micro-flow sensor connecting the two (2) chambers. The electrical signal from the sensor is converted into a DC signal for output to the data logger and front panel meter.

Moisture Sampling Train

Moisture sampling was conducted by EPA Method 4. An impinger sampling train was used to sample for stack gas moisture at the stack sampling location. Or, alternatively, the technicians recorded the wet-bulb and dry-bulb temperatures. The first two (2) impingers each contained about 100 mls of water or hydrogen peroxide, the third impinger was empty, and the fourth impinger contained silica gel. A sample was collected over a 20 - 40 minute period at a constant sampling rate of <.75 cubic feet per minute. The impingers were weighed prior to and following the test run to determine moisture gained. EPA Method 4 calculations were used to determine percent moisture.

QUALITY ASSURANCE ACTIVITIES

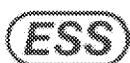
Gaseous Sampling: O₂, CO₂, NO_x

Similar quality control and calibration procedures were used for each of the three (3) on-site instrumental gaseous analyzers: O₂, CO₂ and NO_x. Upon arrival at the test site, each analyzer was unpacked and inspected for possible damage. The instruments were plugged in and allowed to warm up a minimum of 2 hours prior to attempting any calibration procedures. Care was taken to ensure that the analyzers were placed in a controlled temperature environment to minimize analyzer drift. The heated sample lines and probes were also allowed to heat to operating temperatures. The gas conditioner was installed and allowed to cool to an operating temperature of about 33 degrees F.

Electrical voltages supplied to the analyzers are critical for correct operation. Line voltages were checked to ensure that at least 110 volts A.C. were maintained.

While the instruments and sampling lines were warming up, the DAS and gas manifold system were set up. After the analyzers had stabilized, linearity checks were performed on each analyzer. The appropriate EPA Protocol calibration gases were introduced to the gas manifold system, and the data recorded with the DAS.

A zero, mid, and high calibration gas was introduced to the O₂, CO₂ and NO_x monitors. Once the calibration procedure had commenced, the span and zero controls were not touched. If



it was necessary to adjust the zero or span, then the analyzer linearity check would have been started over. Each gas provided a response to the calibration gas within 2 percent of the span value of the instrument for O₂, CO₂ and NO_x.

Following the successful completion of the instrument linearity checks, a sampling system bias check was required for the O₂, CO₂ and NO_x analyzers. A leak check was performed across the sampling system consisting of the heated sample line, gas conditioner, unheated teflon sample line, unheated teflon calibration line, gas manifold, and sample pump. The zero and mid range gas for each of the analyzers was delivered to the system. The resulting concentrations were within 5 percent of the data recorded during the analyzer linearity checks previously recorded.

A system response time check was performed on the sampling system. Since NO_x analyzers are the slowest to respond, the system response time was based upon the data collected from the NO_x analyzer. The response time was the amount of time for the analyzer to display a 95 percent step change in gas concentration.

The instrument calibrations were checked with a zero and mid-level calibration gas prior to and following each test run.

The EPA Method 20 NO₂ to NO converter efficiency check is performed by introducing NO₂ gas into the analyzer in direct calibration mode and recording the NO_x concentration displayed by the analyzer. The NO₂ to NO conversion efficiency, calculated according to Equation 7E-7, must be greater than or equal to 90 percent.

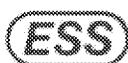
Calibration Procedures

EPA and VA DEQ procedures were followed in performing equipment calibrations. Procedures outlined in the EPA Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, (EPA/600/R-94/038c) were followed, in addition to procedures outlined in the applicable reference methods.

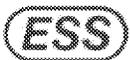
The EPA Method 4 dry gas meter receives a complete calibration prior to and following each field use. The post test calibration must be within 5% of the pre-test calibration.

The procedures outlined in EPA Method 2, section 4.3 are used to verify that the stack temperature thermocouple and dry gas meter thermometer are within allowable tolerances. The absolute temperature measured with the gauge being calibrated and the reference gauge must agree within 1.5 percent.

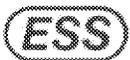
Additional copies of test procedures may be obtained through the EPA website via www.ESSKnowsAir.com.



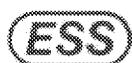
APPENDIX A FIELD DATA



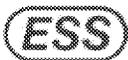
APRIL 20, 2015



TW-18 INLET



INLET Run 1	NOX PPM	O2 %	CO2 %		
Pre Zero	1.03	0.016	0.032		
Pre Span	2,457.00	12.03	8.01		
4/20/2015					
11:30	2092.063	4.615	5.104	O2 %	
11:31	2091.224	4.672	5.077		
11:32	2111.547	4.622	5.111		
11:33	2116.467	4.611	5.108		
11:34	2137.541	4.539	5.120		
11:35	2125.683	4.513	5.134		
11:36	2150.187	4.582	5.122	0.9	1
11:37	2155.377	4.550	5.131		
11:38	2171.796	4.612	5.108		
11:39	2171.484	4.586	5.100		
11:40	2189.291	4.579	5.118		
11:41	2197.881	4.536	5.127		
11:42	2220.189	4.485	5.146		
11:43	2226.864	4.395	5.172	-3.3	2
11:44	2216.898	4.453	5.145		
11:45	2183.237	4.605	5.113		
11:46	2157.120	4.620	5.105		
11:47	2157.560	4.598	5.102		
11:48	2137.804	4.609	5.096		
11:49	2149.032	4.656	5.090		
11:50	2132.332	4.641	5.100	2.2	3
AVERAGE	2,156.742	4.575	5.116	AVG	4.539
Post Zero	1.31	0.02	0.039		
Post Span	2,451.00	11.997	8.005		



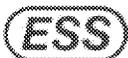
HIGH Run 2	NOX PPM	O2 %	CO2 %
Pre Zero	1.31	0.02	0.039
Pre Span	2,451.00	11.997	8.005

4/20/2015

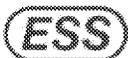
12:00	2100.246	4.628	5.112
12:01	2124.314	4.588	5.115
12:02	2115.374	4.620	5.111
12:03	2130.319	4.599	5.110
12:04	2144.519	4.635	5.104
12:05	2172.920	4.552	5.121
12:06	2188.187	4.585	5.110
12:07	2210.377	4.621	5.108
12:08	2218.127	4.581	5.129
12:09	2230.433	4.549	5.127
12:10	2234.098	4.556	5.133
12:11	2227.638	4.520	5.150
12:12	2245.757	4.535	5.134
12:13	2235.083	4.582	5.125
12:14	2243.224	4.607	5.143
12:15	2217.701	4.611	5.119
12:16	2230.249	4.564	5.118
12:17	2249.167	4.531	5.120
12:18	2261.923	4.466	5.151
12:19	2250.925	4.506	5.144
12:20	2253.998	4.538	5.147

AVERAGE	2,204.028	4.570	5.125
Post Zero	1.74	0.026	0.044
Post Span	2,448.00	11.967	8.001

✓



HIGH Run 3	NOX PPM	O2 %	CO2 %
Pre Zero	1.74	0.026	0.044
Pre Span	2,448.00	11.967	8.001
4/20/2015			
12:30	2239.390	4.618	5.110
12:31	2234.427	4.629	5.113
12:32	2236.984	4.593	5.118
12:33	2242.837	4.651	5.093
12:34	2240.623	4.673	5.103
12:35	2254.765	4.706	5.082
12:36	2249.060	4.706	5.091
12:37	2279.035	4.597	5.116
12:38	2269.780	4.601	5.101
12:39	2293.107	4.536	5.128
12:40	2282.645	4.593	5.129
12:41	2266.039	4.615	5.113
12:42	2271.104	4.619	5.105
12:43	2253.649	4.630	5.095
12:44	2251.343	4.641	5.097
12:45	2250.198	4.666	5.082
12:46	2265.088	4.645	5.078
12:47	2264.672	4.608	5.102
12:48	2279.770	4.670	5.099
12:49	2263.486	4.746	5.070
12:50	2262.523	4.717	5.062
AVERAGE	2,259.549	4.641	5.099
Post Zero	2.03	0.033	0.058
Post Span	2,452.00	11.949	7.995



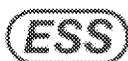
HIGH Run 4	NOX PPM	O2 %	CO2 %
Pre Zero	2.03	0.033	0.058
Pre Span	2,452.00	11.949	7.995

4/20/2015

13:00	2273.833	4.675	5.046
13:01	2286.378	4.693	5.096
13:02	2300.773	4.646	5.006
13:03	2294.590	4.682	5.088
13:04	2311.636	4.667	5.027
13:05	2296.709	4.667	5.074
13:06	2310.026	4.603	5.046
13:07	2306.350	4.642	5.047
13:08	2307.583	4.639	5.007
13:09	2319.368	4.577	5.082
13:10	2312.229	4.592	5.052
13:11	2306.012	4.650	5.049
13:12	2289.769	4.726	5.096
13:13	2274.195	4.708	5.112
13:14	2307.730	4.643	5.044
13:15	2291.554	4.629	5.008
13:16	2326.579	4.516	5.067
13:17	2297.985	4.614	5.011
13:18	2314.899	4.636	5.037
13:19	2307.882	4.614	4.997
13:20	2322.687	4.575	5.031

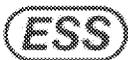
AVERAGE 2,302.80 4.64 5.05

Post Zero 2.23 0.036 0.049 ✓
 Post Span 2,445.00 11.968 7.985 ✓

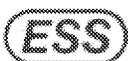


HIGH Run 5	NOX PPM	O2 %	CO2 %
Pre Zero	2.23	0.036	0.049
Pre Span	2,445.00	11.968	7.985
4/20/2015			
13:30	2386.901	4.685	5.090
13:31	2382.436	4.616	5.105
13:32	2392.487	4.670	5.077
13:33	2415.435	4.645	5.081
13:34	2403.219	4.710	5.063
13:35	2435.750	4.642	5.092
13:36	2423.836	4.692	5.074
13:37	2460.073	4.580	5.079
13:38	2444.185	4.595	5.102
13:39	2460.453	4.569	5.116
13:40	2473.679	4.595	5.108
13:41	2443.156	4.725	5.063
13:42	2445.521	4.692	5.093
13:43	2462.312	4.580	5.088
13:44	2467.218	4.580	5.109
13:45	2454.127	4.623	5.095
13:46	2456.564	4.594	5.106
13:47	2434.380	4.638	5.074
13:48	2427.976	4.674	5.060
13:49	2422.479	4.678	5.083
13:50	2447.967	4.587	5.104
AVERAGE	2,435.245	4.637	5.089
Post Zero	2.45	0.04	0.052
Post Span	2,442.00	11.98	7.973

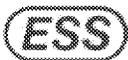
✓✓



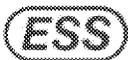
HIGH Run 6	NOX PPM	O2 %	CO2 %
Pre Zero	2.45	0.04	0.052
Pre Span	2,442.00	11.98	7.973
4/20/2015			
14:00	2476.676	4.498	5.119
14:01	2464.960	4.574	5.115
14:02	2459.834	4.603	5.107
14:03	2449.091	4.611	5.099
14:04	2465.550	4.502	5.120
14:05	2476.205	4.495	5.116
14:06	2451.504	4.521	5.106
14:07	2458.809	4.557	5.113
14:08	2468.599	4.485	5.129
14:09	2481.084	4.474	5.121
14:10	2450.217	4.619	5.109
14:11	2458.246	4.474	5.129
14:12	2449.576	4.533	5.104
14:13	2438.372	4.566	5.111
14:14	2432.826	4.562	5.101
14:15	2449.069	4.556	5.110
14:16	2427.887	4.575	5.095
14:17	2436.296	4.615	5.109
14:18	2425.978	4.597	5.105
14:19	2422.857	4.615	5.088
14:20	2440.052	4.565	5.104
AVERAGE	2,451.604	4.552	5.110
Post Zero	2.74	0.045	0.059 ✓
Post Span	2,450.00	11.962	7.986 ✓



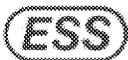
HIGH Run 7	NOX PPM	O2 %	CO2 %
Pre Zero	2.74	0.045	0.059
Pre Span	2,450.00	11.962	7.986
4/20/2015			
14:30	2476.734	4.582	5.107
14:31	2508.758	4.524	5.114
14:32	2462.164	4.574	5.103
14:33	2508.294	4.454	5.150
14:34	2485.517	4.487	5.123
14:35	2489.181	4.545	5.132
14:36	2474.776	4.523	5.124
14:37	2448.301	4.614	5.105
14:38	2443.221	4.632	5.087
14:39	2467.672	4.530	5.105
14:40	2445.802	4.621	5.116
14:41	2419.186	4.711	5.064
14:42	2446.788	4.693	5.064
14:43	2447.845	4.635	5.095
14:44	2443.067	4.617	5.142
14:45	2438.941	4.621	5.138
14:46	2486.892	4.587	5.128
14:47	2432.784	4.631	5.063
14:48	2441.551	4.759	4.923
14:49	2444.568	4.773	5.007
14:50	2508.806	4.737	5.030
AVERAGE	2,462.90	4.61	5.09
Post Zero	3.3	0.057	0.068 ✓
Post Span	2,446.00	11.947	7.991 ✓



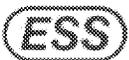
HIGH Run 8	NOX PPM	O2 %	CO2 %
Pre Zero	3.3	0.057	0.068
Pre Span	2,446.00	11.947	7.991
4/20/2015			
15:00	2446.797	4.811	5.042
15:01	2444.351	4.774	5.041
15:02	2461.023	4.727	5.043
15:03	2437.022	4.727	5.048
15:04	2455.476	4.648	5.075
15:05	2459.985	4.572	5.088
15:06	2491.453	4.579	5.103
15:07	2440.221	4.688	5.065
15:08	2458.091	4.659	5.092
15:09	2427.511	4.645	5.074
15:10	2442.520	4.688	5.079
15:11	2446.011	4.699	5.081
15:12	2453.480	4.670	5.058
15:13	2457.184	4.750	5.060
15:14	2483.639	4.652	5.060
15:15	2496.335	4.714	5.050
15:16	2493.750	4.627	5.075
15:17	2492.510	4.646	5.090
15:18	2486.671	4.704	5.061
15:19	2485.348	4.733	5.070
15:20	2487.827	4.787	5.053
AVERAGE	2,464.153	4.690	5.067
Post Zero	3.9	0.066	0.072
Post Span	2,441.00	11.969	8.005



HIGH Run 9	NOX PPM	O2 %	CO2 %
Pre Zero	3.9	0.066	0.072
Pre Span	2,441.00	11.969	8.005
4/20/2015			
15:30	2492.087	4.677	5.082
15:31	2534.819	4.655	5.075
15:32	2502.335	4.743	5.056
15:33	2527.931	4.724	5.046
15:34	2519.861	4.756	5.062
15:35	2525.779	4.760	5.044
15:36	2541.056	4.724	5.068
15:37	2530.588	4.651	5.073
15:38	2528.634	4.702	5.072
15:39	2520.310	4.713	5.063
15:40	2512.484	4.754	5.052
15:41	2514.808	4.721	5.058
15:42	2490.464	4.768	5.043
15:43	2508.839	4.699	5.068
15:44	2502.213	4.619	5.091
15:45	2526.432	4.590	5.104
15:46	2496.100	4.659	5.105
15:47	2485.680	4.685	5.077
15:48	2506.761	4.696	5.075
15:49	2490.656	4.718	5.055
15:50	2529.890	4.659	5.076
AVERAGE	2,513.70	4.70	5.07
Post Zero	4.4	0.072	0.088
Post Span	2,438.00	11.981	8.011



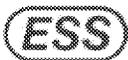
TW-18 OUTLET



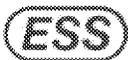
HIGH Run 1	NOX PPM	O2 %	CO2 %
Pre Zero	0.055	0.012	0.032
Pre Span	12.21	11.95	8.001

4/20/2015

				O2 %	
11:30	4.896	4.644	5.143		
11:31	4.764	4.614	5.118		
11:32	4.830	4.504	5.175		
11:33	4.831	4.576	5.154		
11:34	4.947	4.656	5.147		
11:35	5.178	4.553	5.145		
11:36	5.195	4.656	5.130	0.01	1
11:37	5.162	4.568	5.133		
11:38	5.327	4.592	5.169		
11:39	5.277	4.482	5.161		
11:40	5.211	4.478	5.167		
11:41	5.360	4.338	5.210		
11:42	4.620	4.531	5.164		
11:43	4.704	4.652	5.125	-0.06	2
11:44	4.671	4.637	5.146		
11:45	4.903	4.581	5.136		
11:46	4.738	4.630	5.129		
11:47	4.854	4.695	5.124		
11:48	4.640	4.630	5.136		
11:49	4.723	4.706	5.117		
11:50	4.871	4.657	5.136	0.04	3
				AVG	4.655
AVERAGE	4.938	4.589	5.146		
Post Zero	0.059	0.017	0.034		
Post Span	12.18	11.91	8.009		



HIGH Run 2	NOX PPM	O2 %	CO2 %
Pre Zero	0.059	0.017	0.034
Pre Span	12.18	11.91	8.009
4/20/2015			
12:00	4.707	4.612	5.145
12:01	4.740	4.665	5.152
12:02	4.723	4.597	5.129
12:03	4.771	4.646	5.146
12:04	4.936	4.582	5.141
12:05	5.051	4.574	5.151
12:06	5.019	4.620	5.145
12:07	5.233	4.510	5.183
12:08	5.085	4.541	5.168
12:09	5.053	4.545	5.171
12:10	5.185	4.564	5.178
12:11	5.185	4.530	5.171
12:12	5.235	4.606	5.153
12:13	5.186	4.602	5.177
12:14	5.136	4.598	5.149
12:15	5.120	4.530	5.164
12:16	5.103	4.549	5.158
12:17	5.054	4.484	5.182
12:18	5.235	4.560	5.182
12:19	5.119	4.602	5.150
12:20	5.185	4.556	5.174
AVERAGE	5.051	4.575	5.160
Post Zero	0.064	0.015	0.039
Post Span	12.25	11.95	7.993



HIGH Run 3	NOX PPM	O2 %	CO2 %
Pre Zero	0.064	0.015	0.039
Pre Span	12.25	11.95	7.993

4/20/2015

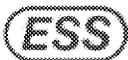
12:30	4.994	4.632	5.162
12:31	3.794	4.613	5.141
12:32	3.810	4.678	5.112
12:33	3.827	4.678	5.128
12:34	3.826	4.705	5.124
12:35	3.892	4.690	5.137
12:36	3.942	4.656	5.148
12:37	3.960	4.633	5.150
12:38	3.994	4.595	5.167
12:39	4.027	4.640	5.164
12:40	3.978	4.622	5.167
12:41	3.979	4.671	5.160
12:42	4.012	4.663	5.138
12:43	3.847	4.652	5.136
12:44	3.996	4.706	5.136
12:45	3.880	4.698	5.113
12:46	3.863	4.652	5.147
12:47	4.127	4.732	5.119
12:48	3.913	4.793	5.109
12:49	4.078	4.694	5.135
12:50	3.996	4.710	5.137
AVERAGE	3.987	4.672	5.140
Post Zero	0.073	0.012	0.047
Post Span	12.16	11.924	7.989



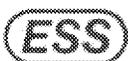
HIGH Run 4	NOX PPM	O2 %	CO2 %
Pre Zero	0.073	0.012	0.047
Pre Span	12.16	11.924	7.989

4/20/2015

13:00	5.094	4.688	5.124
13:01	5.012	4.729	5.116
13:02	5.078	4.695	5.124
13:03	5.011	4.684	5.127
13:04	5.160	4.555	5.152
13:05	5.044	4.672	5.123
13:06	5.060	4.601	5.155
13:07	4.943	4.604	5.132
13:08	5.124	4.605	5.139
13:09	4.942	4.677	5.115
13:10	5.040	4.730	5.097
13:11	4.826	4.734	5.108
13:12	5.123	4.666	5.127
13:13	4.958	4.658	5.136
13:14	5.040	4.522	5.127
13:15	5.057	4.636	5.139
13:16	5.040	4.700	5.137
13:17	5.089	4.612	5.143
13:18	5.006	4.545	5.133
13:19	4.956	4.663	5.135
13:20	4.741	4.693	5.097
AVERAGE	5.016	4.651	5.128
Post Zero	0.088	0.022	0.056
Post Span	12.13	11.954	7.979



HIGH Run 5	NOX PPM	O2 %	CO2 %
Pre Zero	0.088	0.022	0.056
Pre Span	12.13	11.954	7.979
4/20/2015			
13:30	4.978	4.725	5.113
13:31	4.906	4.709	5.109
13:32	5.093	4.766	5.101
13:33	5.127	4.660	5.125
13:34	5.204	4.706	5.122
13:35	5.402	4.581	5.147
13:36	5.435	4.562	5.149
13:37	5.451	4.577	5.148
13:38	5.434	4.604	5.142
13:39	5.319	4.744	5.106
13:40	5.319	4.695	5.149
13:41	5.419	4.581	5.154
13:42	5.402	4.569	5.156
13:43	5.303	4.679	5.141
13:44	5.287	4.611	5.158
13:45	5.172	4.698	5.092
13:46	5.254	4.706	5.120
13:47	5.171	4.683	5.140
13:48	5.237	4.543	5.167
13:49	5.188	4.615	5.134
13:50	5.140	4.645	5.134
AVERAGE	5.250	4.650	5.134
Post Zero	0.115	0.031	0.06
Post Span	12.22	11.973	7.992

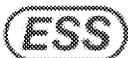


HIGH Run 6	NOX PPM	O2 %	CO2 %
Pre Zero	0.115	0.031	0.06
Pre Span	12.22	11.973	7.992

4/20/2015

14:00	5.254	4.624	5.161
14:01	5.319	4.651	5.152
14:02	5.186	4.541	5.166
14:03	5.302	4.598	5.152
14:04	5.286	4.567	5.158
14:05	5.221	4.564	5.163
14:06	5.320	4.492	5.176
14:07	5.321	4.503	5.148
14:08	5.271	4.614	5.153
14:09	5.272	4.420	5.176
14:10	5.288	4.534	5.151
14:11	5.223	4.561	5.158
14:12	5.306	4.584	5.141
14:13	5.157	4.581	5.139
14:14	4.996	4.558	5.151
14:15	5.212	4.642	5.138
14:16	5.230	4.598	5.154
14:17	5.115	4.606	5.143
14:18	5.230	4.610	5.133
14:19	5.081	4.675	5.132
14:20	5.280	4.705	5.148

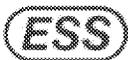
AVERAGE	5.232	4.582	5.152
Post Zero	0.122	0.042	0.069 ✓
Post Span	12.15	11.958	7.98 ✓



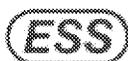
HIGH Run 8	NOX PPM	O2 %	CO2 %
Pre Zero	0.137	0.053	0.074
Pre Span	12.08	11.983	8.01

4/20/2015

15:00	5.746	4.738	5.111
15:01	5.399	4.776	5.107
15:02	5.665	4.621	5.167
15:03	5.467	4.556	5.160
15:04	5.883	4.606	5.162
15:05	5.452	4.712	5.134
15:06	5.568	4.735	5.141
15:07	5.402	4.712	5.135
15:08	5.385	4.754	5.130
15:09	5.634	4.731	5.138
15:10	5.419	4.690	5.116
15:11	5.669	4.822	5.117
15:12	5.603	4.686	5.134
15:13	5.786	4.754	5.119
15:14	5.636	4.660	5.142
15:15	5.470	4.702	5.156
15:16	5.653	4.748	5.111
15:17	5.520	4.767	5.116
15:18	5.753	4.828	5.113
15:19	5.671	4.801	5.102
15:20	5.771	4.676	5.145
AVERAGE	5.598	4.718	5.131
Post Zero	0.149	0.06	0.077 ✓
Post Span	12.1	11.995	8.002 ✓



HIGH Run 9	NOX PPM	O2 %	CO2 %
Pre Zero	0.149	0.06	0.077
Pre Span	12.1	11.995	8.002
4/20/2015			
15:30	5.392	4.807	5.118
15:31	5.674	4.746	5.121
15:32	5.590	4.773	5.140
15:33	5.458	4.807	5.108
15:34	5.757	4.753	5.130
15:35	5.459	4.643	5.141
15:36	5.692	4.761	5.144
15:37	5.543	4.826	5.123
15:38	5.576	4.807	5.115
15:39	5.559	4.731	5.143
15:40	5.376	4.781	5.119
15:41	5.526	4.777	5.148
15:42	5.411	4.621	5.175
15:43	5.544	4.636	5.182
15:44	5.395	4.716	5.166
15:45	5.312	4.754	5.129
15:46	5.562	4.731	5.143
15:47	5.230	4.808	5.115
15:48	5.679	4.690	5.158
15:49	5.363	4.682	5.146
15:50	5.530	4.758	5.131
AVERAGE	5.506	4.743	5.138
Post Zero	0.162	0.066	0.082
Post Span	11.08	11.983	7.993





ENVIRONMENTAL SOURCE SAMPLERS, INC.

PLANT: HONEYWELL							
TEST LOCATION: TW-18 OUTLET							
RUN NUMBER: 1							
DATE: 4/20/2015							
TIME START: 11:30							
TIME STOP: 11:50	MOISTURE COLLECTED			GAS ANALYSIS			
OPERATOR(S): JCA		IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL
METER BOX #: S-39 ✓✓	FINAL	207.0	201.1	1	5.1	4.6	9.7
CORRECTION FACTOR: 1.0007 ✓✓	INITIAL	200.0	200.0	2			
BAR PRESSURE (HG): 29.68 ✓✓	DIFFERENCE	7.0	1.1	3			
STACK DIAMETER (FT): 3.00 ✓✓	TOTAL	8.1	MLS/GRAMS	AVG	5.1	4.6	9.7
PORT NIPPLE LENGTH (IN): NA	METER BOX LEAK CHECK						PITOT LEAK CHECK
NOZZLE SIZE: NA							OK
PROBE TEMP: >250	START	0.000	@	14 ✓✓	IN HG	+	OK
PROBE SIZE/ID: 9V1	STOP	0.000	@	7 ✓✓	IN HG	-	OK
STACK PRESSURE (in. H ₂ O): 0.70							

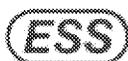
VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS					
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O) ΔP	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	Comments
	A1	1.00	512	0.0	345.352	1.50	69	2	57
	2	1.10	522	5.0	348.878	1.50	69	2	55
	3	0.94	523	10.0	352.405	1.50	70	2	56
	4	0.92	530	15.0	355.931	1.50	70	2	55
	5	1.00	532	20.0	359.458	1.50	70	2	56
	6	0.96	534	25.0	362.985	1.50	71	2	55
	B1	1.10	535	30.0	366.499				
	2	1.20	536						
	3	0.96	536						
	4	1.10	534						
	5	0.96	535						
	6	1.00	536						

γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
21.16	1.0184	1.50	69.83	530.42



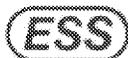
PLANT: HONEYWELL										
TEST LOCATION: TW-18 OUTLET										
RUN NUMBER: 2	ENVIRONMENTAL SOURCE SAMPLERS, INC.									
DATE: 4/20/2015	MOISTURE COLLECTED			GAS ANALYSIS						
TIME START: 12:00	IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL				
TIME STOP: 12:20	FINAL		1	5.2	4.6	9.8 ✓				
OPERATOR(S): JCA	INITIAL		2							
METER BOX #: S-39	DIFFERENCE		3							
CORRECTION FACTOR: 1.0007	TOTAL	8.1	AVG	5.2	4.6	9.8				
BAR PRESSURE (HG): 29.68	METER BOX LEAK CHECK			PITOT LEAK CHECK						
STACK DIAMETER (FT): 3.00	START	@	IN HG	+	OK					
PORT NIPPLE LENGTH (IN): NA	STOP	@	IN HG	-	OK					
NOZZLE SIZE: NA	VELOCITY MEASUREMENTS									
PROBE TEMP: >250	MOISTURE MEASUREMENTS									
PROBE SIZE/ID: 9V1	Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O) ΔP	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	Comments
STACK PRESSURE (in. H ₂ O): 0.70		A1	0.95	516						
		2	1.20	522						
		3	1.10	523						
		4	1.10	526						
		5	1.00	522						
		6	1.05	523						
		B1	1.00	522						
		2	1.10	523						
		3	0.99	524						
		4	0.98	526						
		5	0.97	528						
		6	1.00	528						

γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
	1.0355			523.583



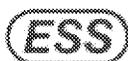
PLANT: HONEYWELL										
TEST LOCATION: TW-18 OUTLET										
RUN NUMBER: 3	ENVIRONMENTAL SOURCE SAMPLERS, INC.									
DATE: 4/20/2015										
TIME START: 12:30	MOISTURE COLLECTED			GAS ANALYSIS						
TIME STOP: 12:50										
OPERATOR(S): JCA		IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL			
METER BOX #: S-39	FINAL			1	5.1	4.7	9.8			
CORRECTION FACTOR: 1.0007	INITIAL			2						
BAR PRESSURE (HG): 29.68	DIFFERENCE			3						
STACK DIAMETER (FT): 3.00	TOTAL	8.1	MLS/GRAMS	AVG	5.1	4.7	9.8			
PORT NIPPLE LENGTH (IN): NA	METER BOX LEAK CHECK									
NOZZLE SIZE: NA						PITOT LEAK CHECK				
PROBE TEMP: >250						OK				
PROBE SIZE/ID: 9V1	START	@	IN HG	+	OK					
STACK PRESSURE (in. H2O): 0.70	STOP	@	IN HG	-	OK					
VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS						
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O)	(in. ΔP	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	Comments
	A1	0.90		515						
	2	0.95		524						
	3	0.98		529						
	4	1.10		530						
	5	1.10		532						
	6	1.10		534						
	B1	1.00		535						
	2	1.10		536						
	3	1.10		536						
	4	1.20		536						
	5	1.20		536						
	6	1.10		536						

γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
	1.0673			531.583



PLANT: HONEYWELL	 ENVIRONMENTAL SOURCE SAMPLERS, INC.								
TEST LOCATION: TW-18 OUTLET									
RUN NUMBER: 4									
DATE: 4/20/2015									
TIME START: 13:00	MOISTURE COLLECTED			GAS ANALYSIS					
TIME STOP: 13:20		IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL		
OPERATOR(S): JCA	FINAL	208.0	202.2	1	5.1	4.7	9.8 ✓		
METER BOX #: S-39	INITIAL	200.0	201.1	2					
CORRECTION FACTOR: 1.0007	DIFFERENCE	8.0	1.1	3					
BAR PRESSURE (HG): 29.68	TOTAL	9.1	MLS/GRAMS	AVG	5.1	4.7	9.8		
STACK DIAMETER (FT): 3.00	METER BOX LEAK CHECK								
PORT NIPPLE LENGTH (IN): NA	PITOT LEAK CHECK					OK			
NOZZLE SIZE: NA	START	0.000	@	14 ✓	IN HG	+	OK		
PROBE TEMP: >250	STOP	0.000	@	7 ✓	IN HG	-	OK		
PROBE SIZE/ID: 9V1									
STACK PRESSURE (in. H ₂ O): 0.70									
VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS					
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O) ΔP	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	Comments
	A1	0.73	522	0.0	366.563	1.50	77	2	52
	2	0.80	525	5.0	370.103	1.50	77	2	53
	3	0.77	525	10.0	373.622	1.50	77	2	53
	4	0.75	523	15.0	377.147	1.50	77	2	53
	5	1.01	524	20.0	380.669	1.50	77	2	53
	6	1.06	526	25.0	384.182	1.50	78	2	53
	B1	1.06	525	30.0	387.685				
	2	0.98	523						
	3	1.06	524						
	4	1.11	525						
	5	1.16	527						
	6	0.98	524						

γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
21.137	0.9501	1.500	77.167	524.417





ENVIRONMENTAL SOURCE SAMPLERS, INC.

PLANT:	HONEYWELL					
TEST LOCATION:	TW-18 OUTLET					
RUN NUMBER:	5					
DATE:	4/20/2015					
TIME START:	13:30					
TIME STOP:	13:50					
OPERATOR(S):	JCA	MOISTURE COLLECTED		GAS ANALYSIS		
METER BOX #:	S-39	IMPINGER	SILICA GEL	CO ₂ %	O ₂ %	TOTAL
CORRECTION FACTOR:	1.0007	FINAL		1	5.1	4.6
BAR PRESSURE (HG):	29.68	INITIAL		2		
STACK DIAMETER (FT):	3.00	DIFFERENCE		3		
PORT NIPPLE LENGTH (IN):	NA	TOTAL	9.1	AVG	5.1	4.6
NOZZLE SIZE:	NA	METER BOX LEAK CHECK				PITOT LEAK CHECK
PROBE TEMP:	>250	START	@	IN HG	+	OK
PROBE SIZE/ID:	9V1	STOP	@	IN HG	-	OK
STACK PRESSURE (in. H ₂ O):	0.70					

VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS					
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O) ΔP	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	Comments
	A1	0.75	517						
	2	0.75	522						
	3	0.96	530						
	4	1.10	531						
	5	0.96	533						
	6	0.95	534						
	B1	0.98	534						
	2	1.10	534						
	3	1.10	534						
	4	1.10	535						
	5	1.10	536						
	6	1.10	536						

γ-Corr.	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
	0.9915			531.333



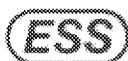


ENVIRONMENTAL SOURCE SAMPLERS, INC.

PLANT: HONEYWELL							
TEST LOCATION: TW-18 OUTLET							
RUN NUMBER: 6							
DATE: 4/20/2015							
TIME START: 14:00							
TIME STOP: 14:20	MOISTURE COLLECTED			GAS ANALYSIS			
OPERATOR(S): JCA		IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL
METER BOX #: S-39	FINAL			1	5.1	4.6	9.7 ✓
CORRECTION FACTOR: 1.0007	INITIAL			2			
BAR PRESSURE (HG): 29.68	DIFFERENCE			3			
STACK DIAMETER (FT): 3.00	TOTAL	9.1	MLS/GRAMS	AVG	5.1	4.6	9.7
PORT NIPPLE LENGTH (IN): NA	METER BOX LEAK CHECK					PITOT LEAK CHECK	
NOZZLE SIZE: NA						OK	
PROBE TEMP: >250	START	@	IN HG	+	OK		
PROBE SIZE/ID: 9V1	STOP	@	IN HG	-	OK		
STACK PRESSURE (in. H ₂ O): 0.70							

VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS					Comments
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O) ΔP	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	
	A1	0.90	535						
	2	1.10	536						
	3	1.10	536						
	4	1.20	536						
	5	1.20	536						
	6	1.10	536						
	B1	1.00	516						
	2	1.20	522						
	3	1.10	523						
	4	1.10	526						
	5	1.00	522						
	6	1.05	523						

γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
	1.0857			528.917





ENVIRONMENTAL SOURCE SAMPLERS, INC.

PLANT: HONEYWELL							
TEST LOCATION: TW-18 OUTLET							
RUN NUMBER: 7							
DATE: 4/20/2015							
TIME START: 14:30							
TIME STOP: 14:50	MOISTURE COLLECTED			GAS ANALYSIS			
OPERATOR(S): JCA		IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL
METER BOX #: S-39	FINAL	208.0	203.3	1	5.1	4.7	9.8
CORRECTION FACTOR: 1.0007	INITIAL	200.0	202.2	2			
BAR PRESSURE (HG): 29.68	DIFFERENCE	8.0	1.1	3			
STACK DIAMETER (FT): 3.00	TOTAL	9.1	MLS/GRAMS	AVG	5.1	4.7	9.8
PORT NIPPLE LENGTH (IN): NA							
NOZZLE SIZE: NA	METER BOX LEAK CHECK					PITOT LEAK CHECK	
PROBE TEMP: >250						OK	
PROBE SIZE/ID: 9V1	START	0.000	@	12	IN HG	+	OK
STACK PRESSURE (in. H ₂ O): 0.70	STOP	0.000	@	5	IN HG	-	OK

VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS					Comments
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O)	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	
	A1	0.75	517	0.0	387.774	1.50	78	2	55
	2	0.75	522	5.0	391.317	1.50	78	2	55
	3	0.96	530	10.0	394.832	1.50	78	2	55
	4	1.10	531	15.0	398.371	1.50	78	2	55
	5	0.96	533	20.0	401.885	1.50	79	2	56
	6	0.95	534	25.0	405.412	1.50	79	2	56
	B1	0.98	534	30.0	408.884				
	2	1.10	534						
	3	1.10	534						
	4	1.10	535						
	5	1.10	536						
	6	1.10	536						

γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
21.125	0.9915	1.500	78.333	531.333





ENVIRONMENTAL SOURCE SAMPLERS, INC.

PLANT: HONEYWELL							
TEST LOCATION: TW-18 OUTLET							
RUN NUMBER: 8							
DATE: 4/20/2015							
TIME START: 15:00							
TIME STOP: 15:20	MOISTURE COLLECTED			GAS ANALYSIS			
OPERATOR(S): JCA		IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL
METER BOX #: S-39	FINAL			1	5.1	4.7	9.8 ✓
CORRECTION FACTOR: 1.0007	INITIAL			2			
BAR PRESSURE (HG): 29.68	DIFFERENCE			3			
STACK DIAMETER (FT): 3.00	TOTAL	9.1	MLS/GRAMS	AVG	5.1	4.7	9.8
PORT NIPPLE LENGTH (IN): NA	METER BOX LEAK CHECK						PITOT LEAK CHECK
NOZZLE SIZE: NA							OK
PROBE TEMP: >250	START	@	IN HG	+	OK		
PROBE SIZE/ID: 9V1	STOP	@	IN HG	-	OK		
STACK PRESSURE (in. H ₂ O): 0.70							

VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS					
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O)	(in. ΔP) Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	Comments
	A1	0.95	509						
	2	1.10	514						
	3	1.10	528						
	4	1.10	529						
	5	1.10	529						
	6	1.10	530						
	B1	1.00	516						
	2	1.20	522						
	3	1.10	523						
	4	1.10	526						
	5	1.00	522						
	6	1.05	523						

γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
	1.0741			522.583





ENVIRONMENTAL SOURCE SAMPLERS, INC.

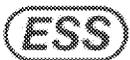
PLANT:	HONEYWELL							
TEST LOCATION:	TW-18 OUTLET							
RUN NUMBER:	9							
DATE:	4/20/2015							
TIME START:	15:30							
TIME STOP:	15:50	MOISTURE COLLECTED			GAS ANALYSIS			
OPERATOR(S):	JCA	IMPINGER	SILICA GEL		CO ₂ %	O ₂ %	TOTAL	
METER BOX #:	S-39	FINAL		1	5.1	4.7	9.8 ✓	
CORRECTION FACTOR:	1.0007	INITIAL		2				
BAR PRESSURE (HG):	29.68	DIFFERENCE		3				
STACK DIAMETER (FT):	3.00	TOTAL	9.1	MLS/GRAMS	AVG	5.1	4.7	9.8
PORT NIPPLE LENGTH (IN):	NA	METER BOX LEAK CHECK						
NOZZLE SIZE:	NA					PITOT LEAK CHECK		
PROBE TEMP:	>250					OK		
PROBE SIZE/ID:	9V1	START	@	IN HG	+	OK		
STACK PRESSURE (in. H ₂ O):	0.70	STOP	@	IN HG	-	OK		

VELOCITY MEASUREMENTS				MOISTURE MEASUREMENTS						
Point Measurement One Port Including Nipple Length (inch)	Reference Point	Pitot (in. H ₂ O)	(in. ΔP)	Stack Temp (F)	Clock Time	Dry Gas Meter FT3	Orifice (in H ₂ O) ΔH	Dry Gas Temperature (F)	Vacuum	Comments
	A1	0.90		461						
	2	1.10		461						
	3	1.10		480						
	4	1.20		488						
	5	1.20		494						
	6	0.95		500						
	B1	0.98		534						
	2	1.10		534						
	3	1.10		534						
	4	1.10		535						
	5	1.10		536						
	6	1.10		536						

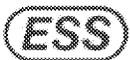
γ-Corr. Ft ³ Drawn	Avg Delta P	Avg Delta H	Avg Dry Gas Temp (F)	Avg Stack Temp (F)
	1.0757			507.750



MAY 11, 2015



TW-18 INLET

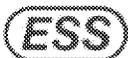


HIGH NOX
Run 1 PPM

Pre Zero 1.21
Pre Span 2,365.00

5/11/2015

		NOX DIFF	
		%	
13:50	1945.509		
13:51	1935.910		
13:52	1928.447		
13:53	1919.110		
13:54	1932.510		
13:55	1946.755		
13:56	1917.981	0.277	1
13:57	1927.157		
13:58	1938.349		
13:59	1952.227		
14:00	1916.100		
14:01	1927.027		
14:02	1917.589		
14:03	1909.676	-0.157	2
14:04	1901.857		
14:05	1917.829		
14:06	1896.854		
14:07	1906.968		
14:08	1893.743		
14:09	1890.099		
14:10	1910.372	-0.121	3
		AVG	1912.676 ✓
AVERAGE	1,920.57		
Post Zero	1.25 ✓		
Post Span	2,362.00 ✓		



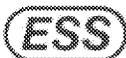
HIGH Run 2	NOX PPM
Pre Zero	1.25
Pre Span	2,362.00

5/11/2015

14:20	1919.105
14:21	1944.188
14:22	1934.176
14:23	1949.101
14:24	1960.627
14:25	1909.604
14:26	1927.660
14:27	1950.221
14:28	1954.590
14:29	1967.984
14:30	1971.795
14:31	1967.569
14:32	1983.293
14:33	1973.555
14:34	1981.395
14:35	1955.413
14:36	1928.251
14:37	1900.488
14:38	1926.270
14:39	1917.375
14:40	1908.229

AVERAGE	1,944.328
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Post Zero	1.48 ✓
Post Span	2,359.00 ✓



HIGH NOX
Run 3 PPM

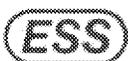
Pre Zero 1.48
Pre Span 2,359.00

5/11/2015

14:50	1,999.92
14:51	1,967.16
14:52	1,955.53
14:53	1,954.56
14:54	1,919.31
14:55	1,935.56
14:56	1,928.54
14:57	1,944.79
14:58	1,932.27
14:59	1,922.33
15:00	1,896.76
15:01	1,904.84
15:02	1,908.04
15:03	1,909.19
15:04	1,907.68
15:05	1,906.26
15:06	1,901.38
15:07	1,912.65
15:08	1,885.58
15:09	1,901.11
15:10	1,920.82

AVERAGE 1,924.49

Post Zero 1.72
Post Span 2,355.00

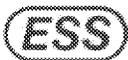


HIGH	NOX
Run 4	PPM
Pre Zero	1.72
Pre Span	2,355.00

5/11/2015

15:20	1,910.81
15:21	1,921.11
15:22	1,938.25
15:23	1,968.43
15:24	1,967.99
15:25	1,984.41
15:26	1,968.70
15:27	1,962.57
15:28	1,954.49
15:29	1,976.95
15:30	1,984.77
15:31	1,935.05
15:32	1,938.33
15:33	1,949.61
15:34	1,944.99
15:35	1,946.24
15:36	1,931.14
15:37	1,909.04
15:38	1,905.75
15:39	1,894.48
15:40	1,896.08

AVERAGE	1,942.34
Post Zero	1.87 ✓
Post Span	2,361.00 ✓



HIGH NOX
Run 5 PPM

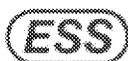
Pre Zero 1.87
Pre Span 2,361.00

5/11/2015

15:50	1955.436
15:51	1948.747
15:52	1957.004
15:53	1982.613
15:54	1972.215
15:55	1951.853
15:56	1942.404
15:57	1939.237
15:58	1923.660
15:59	1935.875
16:00	1951.668
16:01	1918.444
16:02	1924.558
16:03	1939.331
16:04	1944.742
16:05	1932.626
16:06	1931.876
16:07	1909.426
16:08	1907.466
16:09	1900.431
16:10	1923.329

AVERAGE 1,937.759

Post Zero 2.05 ✓
Post Span 2,357.00 ✓



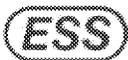
HIGH Run 6	NOX PPM
Pre Zero	2.05
Pre Span	2,357.00

5/11/2015

16:20	1919.960
16:21	1952.405
16:22	1902.525
16:23	1951.064
16:24	1928.824
16:25	1931.393
16:26	1916.706
16:27	1892.746
16:28	1886.718
16:29	1911.515
16:30	1930.594
16:31	1906.356
16:32	1935.202
16:33	1917.777
16:34	1911.897
16:35	1908.418
16:36	2078.269
16:37	2033.524
16:38	1988.691
16:39	1934.834
16:40	1922.613

AVERAGE	1,936.287
Post Zero	2.24
Post Span	2,360.00

✓✓



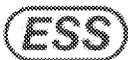
HIGH Run 7	NOX PPM
Pre Zero	2.24
Pre Span	2,360.00

5/11/2015

16:50	1,941.31
16:51	1,932.69
16:52	1,971.40
16:53	1,972.02
16:54	2,018.01
16:55	2,006.82
16:56	1,991.91
16:57	1,953.73
16:58	1,933.05
16:59	1,922.75
17:00	1,921.24
17:01	1,909.17
17:02	1,922.75
17:03	1,920.62
17:04	1,934.91
17:05	1,890.17
17:06	1,902.07
17:07	1,898.07
17:08	1,910.94
17:09	1,910.94
17:10	1,927.37

AVERAGE	1,937.71
Post Zero	2.95
Post Span	2,368.00

✓



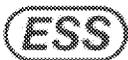
HIGH	NOX
Run 8	PPM
Pre Zero	2.95
Pre Span	2,368.00

5/11/2015

17:20	1,968.58
17:21	1,966.18
17:22	1,946.92
17:23	1,947.01
17:24	1,946.56
17:25	1,947.72
17:26	1,944.96
17:27	1,945.85
17:28	1,926.32
17:29	1,906.52
17:30	1,893.21
17:31	1,872.25
17:32	1,920.28
17:33	1,919.93
17:34	1,947.80
17:35	1,939.10
17:36	1,962.45
17:37	1,956.86
17:38	1,977.19
17:39	1,991.75
17:40	1,993.17

AVERAGE	1,943.839
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Post Zero	2.67
Post Span	2,356.00



HIGH NOX
Run 9 PPM

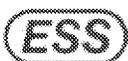
Pre Zero 2.67
Pre Span 2,356.00

5/11/2015

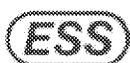
17:50	2,004.18
17:51	2,011.37
17:52	2,015.99
17:53	2,028.51
17:54	2,037.47
17:55	2,023.27
17:56	2,003.91
17:57	1,984.56
17:58	1,974.97
17:59	1,972.58
18:00	1,977.19
18:01	1,988.20
18:02	1,993.26
18:03	1,999.74
18:04	2,021.67
18:05	2,007.73
18:06	2,016.61
18:07	2,026.02
18:08	2,020.60
18:09	2,042.80
18:10	2,017.59

AVERAGE 2,008.01

Post Zero 3.1
Post Span 2,352.00



APPENDIX B CALCULATIONS

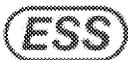


APRIL 20, 2015

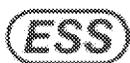


HONEYWELL - HOPEWELL, VA
 TW-18 REDUCTION EFFICIENCY
 April 20, 2015

RUN NUMBER	1	2	3	4	5	6	7	8	9	AVG
INLET NOX (LB/HR)	264.33	273.75	283.77	273.53	295.12	310.95	297.82	312.08	321.56	292.55
OUTLET NOX (LB/HR)	0.60	0.62	0.49	0.59	0.63	0.65	0.64	0.70	0.73	0.63
DESTRUCTION EFF (%)	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8	99.8



TW-18 INLET



HONEYWELL - HOPEWELL, VA
 GASEOUS EMISSIONS DATA - TW-18 INLET
 April 20, 2015

RUN NUMBER	1	2	3	4	5	6	7	8	9
O2 SPAN (%)	20.99	20.99	20.99	20.99	20.99	20.99	20.99	20.99	20.99
O2 MEASURED (%)	4.58	4.57	4.64	4.64	4.64	4.55	4.61	4.69	4.70
O2 SPAN GAS (%)	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98
O2 PRE-ZERO (%)	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.07
O2 POST ZERO (%)	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.07
O2 PRE-SPAN (%)	12.03	12.00	11.97	11.95	11.97	11.98	11.96	11.95	11.97
O2 POST SPAN (%)	12.00	11.97	11.95	11.97	11.98	11.96	11.95	11.97	11.98
INITIAL ZERO CAL BIAS (%)	-0.10	-0.08	-0.05	-0.02	0.00	0.01	0.04	0.10	0.14
FINAL ZERO CAL BIAS (%)	-0.08	-0.05	-0.02	0.00	0.01	0.04	0.10	0.14	0.17
ZERO DRIFT (%)	0.02	0.03	0.03	0.01	0.02	0.02	0.06	0.04	0.03
INITIAL SPAN CAL BIAS (%)	0.33	0.18	0.03	-0.05	0.04	0.10	0.01	-0.06	0.04
FINAL SPAN CAL BIAS (%)	0.18	0.03	-0.05	0.04	0.10	0.01	-0.06	0.04	0.10
SPAN DRIFT (%)	-0.16	-0.14	-0.09	0.09	0.06	-0.09	-0.07	0.10	0.06
O2 CORRECTED (%)	4.55	4.56	4.53	4.63	4.62	4.53	4.59	4.66	4.66

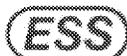
RUN NUMBER	1	2	3	4	5	6	7	8	9
CO2 SPAN (%)	15.91	15.91	15.91	15.91	15.91	15.91	15.91	15.91	15.91
CO2 MEASURED (%)	5.12	5.13	5.10	5.05	5.09	5.11	5.09	5.07	5.07
CO2 SPAN GAS (%)	8.01	8.01	8.01	8.01	8.01	8.01	8.01	8.01	8.01
CO2 PRE-ZERO (%)	0.03	0.04	0.04	0.06	0.05	0.05	0.06	0.07	0.07
CO2 POST ZERO (%)	0.04	0.04	0.06	0.05	0.05	0.06	0.07	0.07	0.09
CO2 PRE-SPAN (%)	8.01	8.01	8.00	8.00	7.99	7.97	7.99	7.99	8.01
CO2 POST SPAN (%)	8.01	8.00	8.00	7.99	7.97	7.99	7.99	8.01	8.01
INITIAL ZERO CAL BIAS (%)	-0.01	0.03	0.06	0.15	0.09	0.11	0.16	0.21	0.24
FINAL ZERO CAL BIAS (%)	0.03	0.06	0.15	0.09	0.11	0.16	0.21	0.24	0.34
ZERO DRIFT (%)	0.04	0.03	0.09	-0.06	0.02	0.04	0.06	0.03	0.10
INITIAL SPAN CAL BIAS (%)	0.06	0.03	0.00	-0.04	-0.10	-0.18	-0.09	-0.06	0.03
FINAL SPAN CAL BIAS (%)	0.03	0.00	-0.04	-0.10	-0.18	-0.09	-0.06	0.03	0.06
SPAN DRIFT (%)	-0.03	-0.03	-0.04	-0.06	-0.08	0.08	0.03	0.09	0.04
CO2 CORRECTED (%)	5.10	5.11	5.09	5.04	5.09	5.11	5.08	5.05	5.04

RUN NUMBER	1	2	3	4	5	6	7	8	9
NOX SPAN (PPM)	4659.00	4659.00	4659.00	4659.00	4659.00	4659.00	4659.00	4659.00	4659.00
NOX MEASURED (PPM)	2156.74	2204.03	2259.55	2302.80	2435.25	2451.60	2462.90	2464.15	2513.70
NOX SPAN GAS (PPM)	2453.00	2453.00	2453.00	2453.00	2453.00	2453.00	2453.00	2453.00	2453.00
NOX PRE-ZERO (PPM)	1.03	1.31	1.74	2.03	2.23	2.45	2.74	3.30	3.90
NOX POST ZERO (PPM)	1.31	1.74	2.03	2.23	2.45	2.74	3.30	3.90	4.40
NOX PRE-SPAN (PPM)	2457.00	2451.00	2448.00	2452.00	2445.00	2442.00	2450.00	2446.00	2441.00
NOX POST SPAN (PPM)	2451.00	2448.00	2452.00	2445.00	2442.00	2450.00	2446.00	2441.00	2438.00
INITIAL ZERO CAL BIAS (%)	0.00	0.01	0.02	0.03	0.03	0.03	0.04	0.05	0.07
FINAL ZERO CAL BIAS (%)	0.01	0.02	0.03	0.03	0.03	0.04	0.05	0.07	0.08
ZERO DRIFT (%)	0.01	0.01	0.01	0.00	0.00	0.01	0.01	0.01	0.01
INITIAL SPAN CAL BIAS (%)	0.17	0.04	-0.02	0.06	-0.09	-0.15	0.02	-0.06	-0.17
FINAL SPAN CAL BIAS (%)	0.04	-0.02	0.06	-0.09	-0.15	0.02	-0.06	-0.17	-0.24
SPAN DRIFT (%)	-0.13	-0.06	0.09	-0.15	-0.06	0.17	-0.09	-0.11	-0.06
NOX CORRECTED (PPM)	2155.72	2207.02	2262.17	2305.90	2444.71	2458.63	2467.95	2473.76	2527.74

HONEYWELL - HOPEWELL, VA
 RATA SUMMARY - TW-18 INLET
 April 20, 2015

NOX and FLOW RATA DATA

RUN NUMBER	1	2	3	4	5	6	7	8	9	AVG
DATE	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	
TIME START (EST)	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	
TIME STOP (EST)	11:50	12:20	12:50	13:20	13:50	14:20	14:50	15:20	15:50	
FLOWRATE (DSCFM)	17,116	17,314	17,510	16,551	16,851	17,654	15,845	17,609	17,757	11,995
O2 (%)	4.55	4.56	4.63	4.63	4.62	4.53	4.59	4.66	4.66	4.60
CO2 (%)	5.10	5.11	5.09	5.04	5.09	5.11	5.08	5.05	5.04	5.08
NOX (PPMVD)	2,155.72	2,207.02	2,262.17	2,306.90	2,444.71	2,458.63	2,467.95	2,473.76	2,527.74	2,367.18
NOX (LB/HR)	264.33	273.75	283.77	273.53	295.12	310.95	297.82	312.08	321.56	292.55



METHOD 7E & 19 CALCULATIONS

Derivation of Calculations and Ex. Calculations

- A_n = Cross-sectional area of nozzle, (ft²)
- B_{wO} = Moisture content of flue gas (vol) as percent
- D_n = Nozzle diameter (in)
- m_n = Total mass of analyte collected, µg
- MW= Molecular weight of analyte collected, g mol⁻¹
- Q_{sw} = Hourly average volumetric flow during unit operation, wet basis, scfh.
- t = Sampling time (min)
- V_m(STD) = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, (dscf)
- V_n(STD) = Nozzle velocity (ft/sec) at standard conditions
- V_s(STD) = Stack velocity (ft/sec) at standard conditions

Emissions (ppmvd @ 15% O2)

$$= \text{ppmvd} \times \frac{(20.9 - 15)}{(20.9 - O_2)}$$

Emissions (ppmv-wet)

$$= \text{ppmvd} \times \left(1 - (B_{wO}/100) \right)$$

Emissions (lb/hr)

$$= \text{ppmvd} \times \frac{\text{Conversion Factor}}{\text{Factor}} \times \text{flowrate (DSCFM)} \times 60 \text{ min/hr}$$

Emissions (lb/mmBTU)

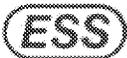
$$= \text{ppmvd} \times \frac{\text{Conversion Factor}}{\text{Factor}} \times \text{F-Factor (DSCFM)} \times 20.9/(20.9-O_2)$$

Verification of Calculations	
From Run 1 (TW-18 Inlet)	
Conversion Factor	NOX 1.194E-07
ppmvd @ 15% O2	778.0
ppm - wet	N/A
lb/hr	264.33
lb/mmBtu	N/A

Method 19 Fuel Factor	
FUEL	O2 F- Factor
COAL	9780
NATURAL GAS	8710
OIL	9190
WOOD	9240
WOOD BARK	9600



TW-18 OUTLET



HONEYWELL - HOPEWELL, VA
GASEOUS EMISSIONS DATA TW-18 OUTLET
April 20, 2015

RUN NUMBER	1	2	3	4	5	6	7	8	9
O2 SPAN (%)	20.99	20.99	20.99	20.99	20.99	20.99	20.99	20.99	20.99
O2 MEASURED (%)	4.59	4.57	4.67	4.65	4.65	4.58	4.70	4.72	4.74
O2 SPAN GAS (%)	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98	11.98
O2 PRE-ZERO (%)	0.01	0.02	0.02	0.01	0.02	0.03	0.04	0.05	0.06
O2 POST ZERO (%)	0.02	0.02	0.01	0.02	0.03	0.04	0.05	0.06	0.07
O2 PRE-SPAN (%)	11.95	11.91	11.95	11.92	11.95	11.97	11.96	11.98	12.00
O2 POST SPAN (%)	11.91	11.95	11.92	11.95	11.97	11.96	11.98	12.00	11.98
INITIAL ZERO CAL BIAS (%)	-0.06	-0.04	-0.05	-0.06	-0.01	0.03	0.08	0.13	0.17
FINAL ZERO CAL BIAS (%)	-0.04	-0.05	-0.05	-0.01	0.03	0.08	0.13	0.17	0.20
ZERO DRIFT (%)	0.02	-0.01	-0.01	0.05	0.04	0.05	0.05	0.03	0.03
INITIAL SPAN CAL BIAS (%)	0.00	-0.19	0.00	-0.12	0.02	0.11	0.04	0.16	0.21
FINAL SPAN CAL BIAS (%)	-0.19	0.00	-0.12	0.02	0.11	0.04	0.16	0.21	0.16
SPAN DRIFT (%)	-0.19	0.19	-0.12	0.14	0.09	-0.07	0.12	0.06	-0.06
O2 CORRECTED (%)	4.60	4.58	4.68	4.66	4.64	4.57	4.68	4.68	4.70

RUN NUMBER	1	2	3	4	5	6	7	8	9
CO2 SPAN (%)	15.91	15.91	15.91	15.91	15.91	15.91	15.91	15.91	15.91
CO2 MEASURED (%)	5.15	5.16	5.14	5.13	5.13	5.15	5.14	5.13	5.14
CO2 SPAN GAS (%)	8.01	8.01	8.01	8.01	8.01	8.01	8.01	8.01	8.01
CO2 PRE-ZERO (%)	0.03	0.03	0.04	0.05	0.06	0.06	0.07	0.07	0.08
CO2 POST ZERO (%)	0.03	0.04	0.05	0.06	0.06	0.07	0.07	0.08	0.08
CO2 PRE-SPAN (%)	8.00	8.01	7.99	7.99	7.98	7.99	7.98	8.01	8.00
CO2 POST SPAN (%)	8.01	7.99	7.99	7.98	7.99	7.98	8.01	8.00	7.99
INITIAL ZERO CAL BIAS (%)	-0.04	-0.03	0.00	0.05	0.11	0.13	0.19	0.22	0.24
FINAL ZERO CAL BIAS (%)	-0.03	0.00	0.05	0.11	0.13	0.19	0.22	0.24	0.27
ZERO DRIFT (%)	0.01	0.03	0.05	0.06	0.03	0.06	0.03	0.02	0.03
INITIAL SPAN CAL BIAS (%)	-0.06	-0.01	-0.11	-0.14	-0.20	-0.12	-0.19	-0.01	-0.06
FINAL SPAN CAL BIAS (%)	-0.01	-0.11	-0.14	-0.20	-0.12	-0.19	-0.01	-0.06	-0.11
SPAN DRIFT (%)	0.05	-0.10	-0.03	-0.06	0.08	-0.08	0.19	-0.05	-0.06
CO2 CORRECTED (%)	5.13	5.15	5.13	5.12	5.13	5.14	5.12	5.10	5.11

RUN NUMBER	1	2	3	4	5	6	7	8	9
NOX SPAN (PPM)	24.93	24.93	24.93	24.93	24.93	24.93	24.93	24.93	24.93
NOX MEASURED (PPM)	4.94	5.05	3.99	5.02	5.25	5.23	5.34	5.60	5.51
NOX SPAN GAS (PPM)	12.18	12.18	12.18	12.18	12.18	12.18	12.18	12.18	12.18
NOX PRE-ZERO (PPM)	0.06	0.06	0.06	0.07	0.09	0.12	0.12	0.14	0.15
NOX POST ZERO (PPM)	0.06	0.06	0.07	0.09	0.12	0.12	0.14	0.15	0.16
NOX PRE-SPAN (PPM)	12.21	12.18	12.25	12.16	12.13	12.22	12.15	12.08	12.10
NOX POST SPAN (PPM)	12.18	12.25	12.16	12.13	12.22	12.15	12.08	12.10	11.08
INITIAL ZERO CAL BIAS (%)	-0.07	-0.05	-0.03	0.00	0.06	0.17	0.20	0.26	0.31
FINAL ZERO CAL BIAS (%)	-0.05	-0.03	0.00	0.06	0.17	0.20	0.26	0.31	0.36
ZERO DRIFT (%)	0.02	0.02	0.04	0.06	0.11	0.03	0.06	0.05	0.05
INITIAL SPAN CAL BIAS (%)	0.09	-0.03	0.25	-0.11	-0.23	0.13	-0.15	-0.43	-0.35
FINAL SPAN CAL BIAS (%)	-0.03	0.25	-0.11	-0.23	0.13	-0.15	-0.43	-0.35	-4.44
SPAN DRIFT (%)	-0.12	0.28	-0.36	-0.12	0.36	-0.28	-0.28	0.08	-4.09
NOX CORRECTED (PPM)	4.90	5.00	3.93	4.98	5.19	5.16	5.29	5.56	5.70

HONEYWELL - HOPEWELL, VA
RATA SUMMARY - TOWER (TW-18)- OUTLET
April 20, 2015

NOX and FLOW RATA DATA

RUN NUMBER	1	2	3	4	5	6	7	8	9	AVG
DATE	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	4/20/2015	
TIME START (EST)	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	
TIME STOP (EST)	11:50	12:20	12:50	13:20	13:50	14:20	14:50	15:20	15:50	
FLOWRATE (WSCFM)	17,428	17,630	17,830	16,890	17,196	18,016	17,196	17,977	18,128	17,588
FLOWRATE (DSCFM)	17,116	17,314	17,510	16,551	16,851	17,654	16,845	17,609	17,757	17,245
O2 (%)	4.6	4.6	4.7	4.7	4.6	4.6	4.7	4.7	4.7	4.64
CO2 (%)	5.1	5.2	5.1	5.1	5.1	5.1	5.1	5.1	5.1	5.13
NOX (PPMVD)	4.90	5.00	3.93	4.98	5.19	5.16	5.29	5.56	5.70	5.08
NOX (LB/HR)	0.60	0.62	0.49	0.59	0.63	0.65	0.64	0.70	0.73	0.63

CEM DATA	1	2	3	4	5	6	7	8	9	AVG
TIME START (EST)	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	
TIME STOP (EST)	11:50	12:20	12:50	13:20	13:50	14:20	14:50	15:20	15:50	
CEM FLOWRATE (SCFM)	20,140.14	20,174.75	20,221.31	20,258.09	20,243.94	20,112.11	20,182.94	20,254.99	20,242.45	20,203.41
CEM NOX (PPM)	4.26	4.02	3.50	4.31	4.31	4.32	4.54	4.90	5.07	4.36
CEM NOX (LB/HR)	0.62	0.59	0.51	0.63	0.64	0.63	0.67	0.72	0.75	0.64



HONEYWELL
DETERMINATION OF FLOWRATE - RESULTS
TW-18 OUTLET

FIELD DATA

Date	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	4/20/15	Average
Run Number	1	2	3	4	5	6	7	8	9	8	7	6	5	4	3	2	1	
Run Start Time	11:30	12:00	12:30	13:00	13:30	14:00	14:30	15:00	15:30	15:00	14:30	14:00	13:30	13:00	12:30	12:00	11:30	
Run Stop Time	11:50	12:20	12:50	13:20	13:50	14:20	14:50	15:20	15:50	15:20	14:50	14:20	13:50	13:20	12:50	12:20	11:50	hh:mm
Meter Calibration Factor	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	1.0007	hh:mm
Pitot Tube Coefficient	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	
Total Meter Volume	21.162			21.137			21.125				21.125							ft ³
Total Sampling Time	30.0			30.0			30.0				30.0							min
Average Meter Temperature	69.8			77.2			78.3				78.3							°F
Average Stack Temperature	530.4			524.4			531.3				522.6							°F
Absolute Stack Pressure	29.73			29.73			29.73				29.73							in Hg
Average Sample Rate	1.50			1.50			1.50				1.50							dscfm
Avg Square Root Pitot Pressure ($\Delta p^{1/2}$) _{avg}	1.018			0.950			0.992				1.074							(in H ₂ O) ^{1/2}

MOISTURE CONTENT DATA

Total Water Volume Collected	(V _w)	8.1	8.1	8.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	9.1	8.8	ml
Standard Water Vapor Vol	(V _w) _{std}	0.382	0.382	0.382	0.429	0.429	0.429	0.429	0.429	0.429	0.429	0.429	0.429	0.429	0.429	0.429	0.429	0.414	scf
Standard Meter Vol	(V _m) _{std}	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.959	20.776	dscf
Stack Moisture Content	(B _w)	1.79	1.79	1.79	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	2.01	1.95	%

GAS ANALYSIS DATA

Run Number	1	2	3	4	5	6	7	8	9
Carbon Dioxide Percentage (%CO ₂)	5.1	5.2	5.1	5.1	5.1	5.1	5.1	5.1	5.1
Oxygen Percentage (%O ₂)	4.6	4.6	4.7	4.7	4.6	4.6	4.7	4.7	4.7
Carbon Monoxide Percentage (%CO)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Nitrogen Percentage (%N ₂)	90.3	90.2	90.2	90.2	90.3	90.3	90.2	90.2	90.2
Dry Gas Molecular Wt (M _d)	29.00	29.02	29.00	29.00	29.00	29.00	29.00	29.00	29.00
Wet Stack Gas Molecular Wt (M _w)	28.98	29.00	28.98	28.98	28.98	28.98	28.98	28.98	28.98
Calculated Fuel Factor (F _c)	3.196	3.135	3.176	3.176	3.196	3.196	3.176	3.176	3.176
Percent Excess Air (%EA)	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

VOLUMETRIC FLOW RATE DATA

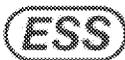
Average Stack Gas Velocity	(V _a)	77.57	77.93	79.45	74.72	76.61	76.61	76.61	76.61	76.61	76.61	76.61	76.61	76.61	76.61	76.61	76.61	77.91	f/sec
Stack Cross-Sectional Area	(A _s)	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	7.07	ft ²
Actual Stack Flow Rate	(Q _a)	32899	33050	33696	31690	32490	32490	32490	32490	32490	32490	32490	32490	32490	32490	32490	32490	33042	acfm
Wet Standard Stack Flow Rate	(Q _{sw})	17428	17630	17930	16890	17196	17196	17196	17196	17196	17196	17196	17196	17196	17196	17196	17196	17588	scfm
Dry Standard Stack Flow Rate	(Q _d)	17116	17314	17510	16551	16851	16851	16851	16851	16851	16851	16851	16851	16851	16851	16851	16851	17245	dscfm

CEMS DATA

Wet Standard Stack Flow Rate	20,140	20,175	20,221	20,258	20,244	20,112	20,183	20,255	20,242	20,203	20,203	20,203	20,203	20,203	20,203	20,203	20,203	20,203	scfm
------------------------------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	--------	------

RELATIVE ACCURACY TEST DATA

Difference	-2712	-2545	-2392	-3368	-3048	-2096	-2987	-2278	-2115	-2616	-2616	-2616	-2616	-2616	-2616	-2616	-2616	-2616	scfm
Percent Difference	-15.56	-14.44	-13.41	-19.94	-17.73	-11.64	-17.37	-12.67	-11.67	-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	-14.94	%
Standard Deviation																			445.78
2.5% Error Confidence																			342.66
T-Value																			2.306
BAF																			1.00
Relative Accuracy																			16.82



FLOWRATE BY METHODS 1-4

Derivation of Calculations and Ex. Calculations

$$\Delta P_{avg} = \left(\frac{\sum(\Delta P)^{1/2}}{\text{number of sample points}} \right)^2$$

$A_S =$ Area of the stack (ft²)
 $C_P =$ Pitot tube coefficient
 $K_P = 85.49^{ft/sec} \left(\frac{(\text{lb/lb-mole})(\text{in Hg})}{(^{\circ}R)(\text{in H}_2\text{O})} \right)^{1/2}$
 $M_S =$ Molecular weight of flue gas, including water vapor
 $P_{BAR} =$ Barometric pressure (in Hg)
 $P_{ST} =$ P_{static} (in Hg)
 $P_S =$ Stack pressure = P_{BAR} ± P_{static} (in Hg)
 $T_M =$ Average Meter Temperature (°F)
 $T_S =$ Flue gas temperature (°F)
 $V_M =$ Volume of gas sampled at meter conditions (ft³)
 $V_{MSTD} =$ Volume of gas sampled at standard conditions (ft³)
 $V_S =$ Velocity of flue gas (ft/sec)
 $V_{WC} =$ Volume of water condensed in impinger train (ml)
 $V_{WSTD} =$ Volume of water vapor in gas samples at standard conditions (ft³)

Verification of Calculations			
From Outlet Run 1			
(V _M)STD =	20.959	DSCF	✓
(V _W)STD =	0.382	ft ³	✓
B _{WU} =	1.79	%	✓
V _S =	77.57	FPS	✓
ACFM =	32,899	CFM	✓
DSCFM =	17,116	DSCFM	✓
WSCFM =	17,428	WSCFM	
WSCFH =	1046	KSCFH	

Dry Gas Volume (FT³)

$$(V_M)STD = \frac{(528^{\circ}R)}{(29.92 \text{ in.Hg})} (V_M) \frac{P_{BAR}}{(T_M + 460)} \quad (V_M)STD = 17.65 (V_M) \frac{(P_{BAR}) + (P_{ST})}{(T_M + 460)}$$

Volume of Water Vapor (FT³)

$$(V_W)STD = nRT/P = \frac{\left(\frac{V_{WC}(gm)}{(18 \text{ lb} \times 454 \text{ gm}) / (\text{lb mole} \times \text{lb})} \right) \times \left(\frac{21.85 \text{ ft}^3 \times \text{in.Hg.}}{\text{lb. mole } ^{\circ}R} \right) \times \left(\frac{68^{\circ} + 460^{\circ}R}{1} \right)}{29.92}$$

Moisture Content (by volume)

$$B_{WO} = \frac{V_{WSTD}}{V_{WSTD} + V_{MSTD}}$$

Velocity

$$V_S = (K_P) (C_P) (\Delta P)^{1/2}_{avg} \times \left(\frac{(T_S + 460)}{(M_S) (P_S)} \right)^{1/2}$$

Flowrates

$$ACFM = (V_S) (A_S) (60 \text{ sec/min})$$

$$DSCFM = \frac{(ACFM)(P_S)(1-B_{WO})(528^{\circ}R)}{(29.92 \text{ in.Hg})(T_S-460^{\circ})}$$

$$WSCFM = DSCFM/(1-B_{WO})$$



**Relative Accuracy
Derivation of Calculations and Ex. Calculations (NOX)**

- d = Arithmetic mean of the difference (between the RM and CEMS) of a data set
- n = Number of data sets (or runs) utilized in S_d and RA calculations
- CC = 2.5 percent error confidence coefficient
- RA = Relative accuracy of the data set

All data must be compared on a common basis. Each RM run is corrected to the units of the emission standard with the corresponding Method 3a data. For this unit, the emission standard is SO₂ (ppm corrected to 0% O₂). CEMS and RM data is collected on the same basis (ppmvd).

RA Supporting Calculations

$$d = \frac{1}{n} \sum_{i=1}^n d_i \quad (\text{where } n = \text{number of data points})$$

$$S_d = \left[\frac{\sum_{i=1}^n d_i^2 - \frac{\left[\sum_{i=1}^n d_i \right]^2}{n}}{n-1} \right]^{1/2}$$

$$CC = t_{0.975} \frac{S_d}{n^{1/2}}$$

$$RA = \frac{|d| + |CC|}{\overline{RM}} \times 100$$

*In cases where the average emissions for the test are less than 50 percent of the applicable standard, substitute the emission standard value in the denominator in place of RM

Example NOX PPM Calculations TW-18 Outlet

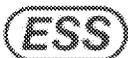
- d = 0.72
- S_d = 0.16
- CC = 0.13
- RM = 5.1
- RA = 16.67 ✓

t-Values

(Table 2-1 from PS 2)

n _a	t _{0.975}
9	2.306
10	2.262
11	2.228
12	2.201

The values in this table are corrected for n-1 degrees of freedom.



Gaseous Data (NOX) BY METHOD 7E
Derivation of Calculations and Ex. Calculations

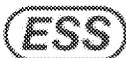
- ACE = Analyzer calibration error, percent of calibration span
- B_{W/S} = Moisture content of sample gas as measured by Method 4 or other approved method, percent/100
- C_{avg} = Average unadjusted gas concentration indicated by data recorder for the test run, ppmv
- C_O = Pollutant concentration adjusted to dry conditions, ppmv
- C_{Dir} = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode, ppmv
- C_{gas} = Average effluent gas concentration adjusted for bias, ppmv
- C_M = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppmv
- C_{MA} = Actual concentration of the upscale calibration gas, ppmv
- C_{Native} = Gas concentration in the stack gas as calculated in Section 12.6, ppmv
- C_O = Average of the initial and final system calibration bias check responses from the low-level (or zero) calibration gas, ppmv
- C_{OA} = Actual concentration of the low-level calibration gas, ppmv
- C_S = Measured concentration of a calibration gas (low, mid or high) when introduced in system calibration mode
- CS = Calibration span, ppmv
- C_V = Manufacturer certified concentration of a calibration gas (low, mid, or high), ppmv
- D = Drift assessment, percent of calibration span
- SB = System bias, percent of calibration span
- SB_i = Pre-run system bias, percent of calibration span
- SB_{Final} = Post-run system bias, percent of calibration span
- SCE = System calibration error, percent of calibration span
- SCE_i = Pre-run system calibration error, percent of calibration span
- SCE_{Final} = Post-run system calibration error, percent of calibration span

$$ACE = \frac{C_{Dir} - C_V}{CS} \times 100 \qquad SB = \frac{C_S - C_{Dir}}{CS} \times 100 \qquad Eff_{NO2} = \frac{C_{dir}}{C_V} \times 100$$

$$D = |SB_{Final} - SB_i| \qquad C_{gas} = \frac{C_{MA}}{(C_{Avg} - C_O) \frac{C_M - C_O}{C_M - C_O}}$$

Example Calculations for Run 1 NOx

Linearity Calculation	Bias (Pre-Run Zero)	Effluent Gas Concentration (Corrected for Drift)
C _{Dir} = 24.99 ppmv	C _S = 0.06 ppmv	C _{avg} = 4.94 ppmv
C _V = 24.93 ppmv	C _{Dir} = 0.07 ppmv	C _O = 0.06 ppmv
CS = 24.93 ppmv	SB = -0.07 %	C _{MA} = 12.18 ppmv
ACE = 0.241 %		C _M = 12.20 ppmv
Bias (Post Run Zero)	Bias (Pre-Run Upscale)	C _{gas} = 4.90 ppmv ✓
C _S = 0.06 ppmv	C _S = 12.21 ppmv	
C _{Dir} = 0.07 ppmv	C _{Dir} = 12.19 ppmv	
SB = -0.05 %	SB = 0.09 %	
Bias (Post Run Upscale)	Zero Drift	
C _S = 12.18 ppmv	SB _i = -0.07 %	
C _{Dir} = 12.19 ppmv	SB _{Final} = -0.05 %	
SB = -0.03 %	D = 0.02 % ✓	
Span Drift		
SB _i = 0.09 %		
SB _{Final} = -0.03 % ✓		
D = 0.12 % ✓		



METHOD 7E & 19 CALCULATIONS

Derivation of Calculations and Ex. Calculations

- A_n = Cross-sectional area of nozzle, (ft²)
- B_{wO} = Moisture content of flue gas (vol) as percent
- D_n = Nozzle diameter (in)
- m_n = Total mass of analyte collected, μg
- MW = Molecular weight of analyte collected, g mol⁻¹
- Q_{sw} = Hourly average volumetric flow during unit operation, wet basis, scfh.
- t = Sampling time (min)
- V_m(STD) = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, (dscf)
- V_n(STD) = Nozzle velocity (ft/sec) at standard conditions
- V_s(STD) = Stack velocity (ft/sec) at standard conditions

Verification of Calculations	
From Run 1 (TW-18 Outlet)	
Conversion Factor	NOX 1.194E-07
ppmvd @ 15% O2	1.81
ppm - wet	N/A
lb/hr	0.60
lb/mmbtu	N/A

Emissions (ppmvd @ 15% O2)

$$= \text{ppmvd} \times \frac{(20.9 - 15)}{(20.9 - O_2)}$$

Emissions (ppmv-wet)

$$= \text{ppmvd} \times \left(1 - (B_{wo}/100) \right)$$

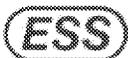
Emissions (lb/hr)

$$= \text{ppmvd} \times \frac{\text{Conversion Factor}}{\text{Factor}} \times \text{flowrate (D5CFM)} \times 60 \text{ min/hr}$$

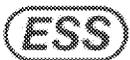
Emissions (lb/mmBTU)

$$= \text{ppmvd} \times \frac{\text{Conversion Factor}}{\text{Factor}} \times \text{F-Factor (D5CFM)} \times 20.9/(20.9-O_2)$$

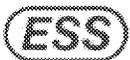
Method 19 Fuel Factor	
FUEL	O2 F- Factor
COAL	9780
NATURAL GAS	8710
OIL	9190
WOOD	9240
WOOD BARK	9600



MAY 11, 2015



TW-18 INLET



HONEYWELL - HOPEWELL, VA.
 GASEOUS EMISSIONS DATA - TW-18 INLET
 May 11, 2015

RUN NUMBER	1	2	3	4	5	6	7	8	9
NOX SPAN (PPM)	4398.00	4398.00	4398.00	4398.00	4398.00	4398.00	4398.00	4398.00	4398.00
NOX MEASURED (PPM)	1920.57	1944.33	1924.49	1942.34	1937.76	1936.29	1937.71	1943.84	2008.01
NOX SPAN GAS (PPM)	2366.00	2366.00	2366.00	2366.00	2365.00	2366.00	2366.00	2366.00	2366.00
NOX PRE-ZERO (PPM)	1.21	1.25	1.48	1.72	1.87	2.05	2.24	2.95	2.67
NOX POST ZERO (PPM)	1.25	1.48	1.72	1.87	2.05	2.24	2.95	2.67	3.10
NOX PRE-SPAN (PPM)	2365.00	2362.00	2359.00	2355.00	2361.00	2357.00	2360.00	2368.00	2356.00
NOX POST SPAN (PPM)	2362.00	2359.00	2355.00	2361.00	2357.00	2360.00	2368.00	2356.00	2352.00
INITIAL ZERO CAL BIAS (%)	0.00	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.03
FINAL ZERO CAL BIAS (%)	0.00	0.01	0.01	0.02	0.02	0.03	0.04	0.03	0.04
ZERO DRIFT (%)	0.00	0.01	0.01	0.00	0.00	0.00	0.02	-0.01	0.01
INITIAL SPAN CAL BIAS (%)	-0.11	-0.18	-0.25	-0.34	-0.20	-0.30	-0.23	-0.05	-0.32
FINAL SPAN CAL BIAS (%)	-0.18	-0.25	-0.34	-0.20	-0.30	-0.23	-0.05	-0.32	-0.41
SPAN DRIFT (%)	-0.07	-0.07	-0.09	0.14	-0.09	0.07	0.18	-0.27	-0.09
NOX CORRECTED (PPM)	1922.38	1948.62	1931.54	1948.61	1943.16	1942.06	1938.88	1946.63	2017.82

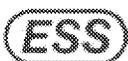
HONEYWELL - HOPEWELL, VA.
 RATA SUMMARY - TW-18 INLET
 May 11, 2015

NOX DATA

RUN NUMBER	1	2	3	4	5	6	7	8	9
DATE	5/11/2015	5/11/2015	5/11/2015	5/11/2015	5/11/2015	5/11/2015	5/11/2015	5/11/2015	5/11/2015
TIME START (EST)	13:50	14:20	14:50	15:20	15:50	16:20	16:50	17:20	17:50
TIME STOP (EST)	14:10	14:40	15:10	15:40	16:10	16:40	17:10	17:40	18:10
NOX (PPMVD)	1,922.38	1,948.62	1,931.54	1,948.61	1,943.16	1,942.06	1,938.88	1,946.63	2,017.82

CEM DATA

	1	2	3	4	5	6	7	8	9
TIME START (EST)	13:50	14:20	14:50	15:20	15:50	16:20	16:50	17:20	17:50
TIME STOP (EST)	14:10	14:40	15:10	15:40	16:10	16:40	17:10	17:40	18:10
CEM NOX UNIT A (PPM)	1,950.55	2,037.48	2,042.71	2,006.46	1,961.24	1,996.21	2,045.11	2,038.91	2,077.96
CEM NOX UNIT B (PPM)	2,045.34	2,139.01	2,146.16	2,105.99	2,046.47	2,046.57	2,121.33	2,138.59	2,191.99



Gaseous Data (NOX) BY METHODS 7E
Derivation of Calculations and Ex. Calculations

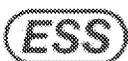
- ACE = Analyzer calibration error, percent of calibration span
- B_{WS} = Moisture content of sample gas as measured by Method 4 or other approved method, percent/100
- C_{avg} = Average unadjusted gas concentration indicated by data recorder for the test run, ppmv
- C_O = Pollutant concentration adjusted to dry conditions, ppmv
- C_{Dir} = Measured concentration of a calibration gas (low, mid, or high) when introduced in direct calibration mode, ppmv
- C_{gas} = Average effluent gas concentration adjusted for bias, ppmv
- C_M = Average of initial and final system calibration bias check responses for the upscale calibration gas, ppmv
- C_{MA} = Actual concentration of the upscale calibration gas, ppmv
- C_{Native} = Gas concentration in the stack gas as calculated in Section 12.6, ppmv
- C_O = Average of the initial and final system calibration bias check responses from the low-level (or zero) calibration gas, ppmv
- C_{OA} = Actual concentration of the low-level calibration gas, ppmv
- C_S = Measured concentration of a calibration gas (low, mid or high) when introduced in system calibration mode
- CS = Calibration span, ppmv
- C_V = Manufacturer certified concentration of a calibration gas (low, mid, or high), ppmv
- D = Drift assessment, percent of calibration span
- SB = System bias, percent of calibration span
- SB_i = Pre-run system bias, percent of calibration span
- SB_{Final} = Post-run system bias, percent of calibration span
- SCE = System calibration error, percent of calibration span
- SCE_i = Pre-run system calibration error, percent of calibration span
- SCE_{Final} = Post-run system calibration error, percent of calibration span

$$ACE = \frac{C_{Dir} - C_V}{CS} \times 100 \qquad SB = \frac{C_S - C_{Dir}}{CS} \times 100 \qquad Eff_{NO2} = \frac{C_{dir}}{C_V} \times 100$$

$$D = |SB_{Final} - SB_i| \qquad C_{gas} = \frac{C_{MA}}{(C_{AVG} - C_O) \frac{C_M - C_O}{C_M - C_O}}$$

Example Calculations for Run 1 NOx

Linearity Calculation	Bias (Pre-Run Zero)	Effluent Gas Concentration (Corrected for Drift)
C _{Dir} = 4393.00 ppmv	C _S = 1.21 ppmv	C _{avg} = 1920.57 ppmv
C _V = 4398.00 ppmv	C _{Dir} = 1.13 ppmv	C _O = 1.23 ppmv
CS = 4398.00 ppmv	SB = 0.00 %	C _{MA} = 2366.00 ppmv
ACE = -0.114 %		C _M = 2363.50 ppmv
Bias (Post Run Zero)	Bias (Pre-Run Upscale)	C _{gas} = 1922.38 ppmv ✓
C _S = 1.25 ppmv	C _S = 2365.00 ppmv	
C _{Dir} = 1.13 ppmv	C _{Dir} = 2370.00 ppmv	
SB = 0.00 %	SB = -0.11 %	
Bias (Post Run Upscale)	Zero Drift	
C _S = 2362.00 ppmv	SB _i = 0.00 %	
C _{Dir} = 2370.00 ppmv	SB _{Final} = 0.00 %	
SB = -0.18 %	D = 0.00 % ✓	
Span Drift		
SB _i = -0.11 %		
SB _{Final} = -0.18 %		
D = 0.07 % ✓		



**Relative Accuracy
Derivation of Calculations and Ex. Calculations (NOX)**

- d = Arithmetic mean of the difference (between the RM and CEMS) of a data set
- n = Number of data sets (or runs) utilized in S_d and RA calculations
- CC = 2.5 percent error confidence coefficient
- RA = Relative accuracy of the data set

All data must be compared on a common basis. Each RM run is corrected to the units of the emission standard with the corresponding Method 3a data. For this unit, the emission standard is SO₂ (ppm corrected to 0% O₂). CEMS and RM data is collected on the same basis (ppmvd).

RA Supporting Calculations

$$d = \frac{1}{n} \sum_{i=1}^n d_i \quad (\text{where } n = \text{number of data points})$$

$$S_d = \left[\frac{\sum_{i=1}^n d_i^2 - \frac{\left[\sum_{i=1}^n d_i \right]^2}{n}}{n-1} \right]^{1/2}$$

$$CC = \frac{t_{0.975} S_d}{n^{1/2}}$$

$$RA = \frac{|d| + |CC|}{RM} \times 100$$

*In cases where the average emissions for the test are less than 50 percent of the applicable standard, substitute the emission standard value in the denominator in place of RM

Example NOX PPM Calculations TW-18 Inlet Unit A

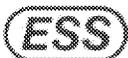
- d = 68.55
- S_d = 33.13
- CC = 25.47
- RM = 1948.9
- RA = 4.82 ✓

t-Values

(Table 2-1 from PS 2)

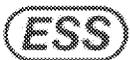
n _a	t _{0.975}
9	2.306 ✓
10	2.262
11	2.228
12	2.201

The values in this table are corrected for n-1 degrees of freedom.



APPENDIX C

OPERATIONAL DATA



APRIL 20, 2015



TW-18 OUTLET



AI_94013_NOX.PV
FI_94069.PV

TW-18 Outlet

R1	4/20/2015 11:30	4/20/2015 11:50
R2	4/20/2015 12:00	4/20/2015 12:20
R3	4/20/2015 12:30	4/20/2015 12:50
R4	4/20/2015 13:00	4/20/2015 13:20
R5	4/20/2015 13:30	4/20/2015 13:50
R6	4/20/2015 14:00	4/20/2015 14:20
R7	4/20/2015 14:30	4/20/2015 14:50
R8	4/20/2015 15:00	4/20/2015 15:20
R9	4/20/2015 15:30	4/20/2015 15:50



TW-18 Outlet

Timestamp	NOx ppm AI_94013_NOX.PV - Average	Flow Rate SCFM FI_94069.PV - Average	NOx lb/hr
4/20/2015 11:30	3.70	19959.96	0.54
4/20/2015 11:31	4.34	20119.32	0.63
4/20/2015 11:32	4.06	19914.45	0.59
4/20/2015 11:33	3.62	20055.32	0.53
4/20/2015 11:34	4.33	20166.34	0.63
4/20/2015 11:35	3.93	20228.39	0.58
4/20/2015 11:36	4.28	20209.93	0.63
4/20/2015 11:37	4.40	19987.70	0.64
4/20/2015 11:38	4.35	20351.78	0.64
4/20/2015 11:39	4.40	20066.83	0.64
4/20/2015 11:40	4.81	20148.11	0.70
4/20/2015 11:41	4.36	19955.06	0.63
4/20/2015 11:42	3.93	20319.96	0.58
4/20/2015 11:43	4.78	20220.36	0.70
4/20/2015 11:44	3.84	20072.35	0.56
4/20/2015 11:45	3.79	20217.68	0.56
4/20/2015 11:46	4.27	20510.23	0.64
4/20/2015 11:47	4.85	20059.69	0.71
4/20/2015 11:48	4.91	20075.72	0.72
4/20/2015 11:49	4.12	20100.60	0.60
4/20/2015 11:50	4.48	20203.21	0.66
	4.26	20140.14	0.62



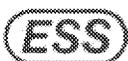
TW-18 Outlet

	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPV AI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average 34069.PV - Average			
4/20/2015 12:00	3.96	20121.47	0.58
4/20/2015 12:01	4.09	20018.51	0.60
4/20/2015 12:02	3.95	20178.00	0.58
4/20/2015 12:03	3.90	20148.38	0.57
4/20/2015 12:04	4.77	20075.74	0.70
4/20/2015 12:05	4.71	20517.30	0.70
4/20/2015 12:06	4.71	20141.64	0.69
4/20/2015 12:07	4.71	20252.53	0.69
4/20/2015 12:08	4.71	20050.27	0.69
4/20/2015 12:09	4.71	19916.73	0.68
4/20/2015 12:10	3.86	19974.00	0.56
4/20/2015 12:11	2.75	20246.23	0.40
4/20/2015 12:12	4.02	20171.34	0.59
4/20/2015 12:13	4.72	20419.74	0.70
4/20/2015 12:14	3.21	20130.71	0.47
4/20/2015 12:15	3.26	19983.19	0.47
4/20/2015 12:16	4.70	20240.04	0.69
4/20/2015 12:17	4.78	20110.70	0.70
4/20/2015 12:18	3.01	20227.14	0.44
4/20/2015 12:19	3.04	20233.70	0.45
4/20/2015 12:20	2.93	20512.46	0.44
	4.02	20174.75	0.59



TW-18 Outlet

	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPV AI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average FI_94069.PV - Average			
4/20/2015 12:30	3.45	20103.38	0.50
4/20/2015 12:31	3.33	20288.38	0.49
4/20/2015 12:32	3.93	20244.79	0.58
4/20/2015 12:33	3.80	20280.36	0.56
4/20/2015 12:34	3.67	20419.64	0.54
4/20/2015 12:35	3.01	20054.51	0.44
4/20/2015 12:36	2.86	20053.02	0.42
4/20/2015 12:37	3.15	20319.22	0.47
4/20/2015 12:38	3.39	20286.69	0.50
4/20/2015 12:39	3.56	20396.65	0.53
4/20/2015 12:40	3.07	20234.42	0.45
4/20/2015 12:41	2.93	20394.41	0.43
4/20/2015 12:42	3.24	20047.69	0.47
4/20/2015 12:43	3.24	20078.79	0.47
4/20/2015 12:44	3.20	20071.42	0.47
4/20/2015 12:45	3.87	20362.73	0.57
4/20/2015 12:46	4.37	20515.08	0.65
4/20/2015 12:47	3.95	20111.14	0.58
4/20/2015 12:48	3.34	20243.86	0.49
4/20/2015 12:49	4.03	20114.50	0.59
4/20/2015 12:50	4.03	20026.87	0.59
	3.50	20221.31	0.51



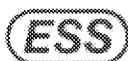
TW-18 Outlet

	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPV AI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average FI_94069.PV - Average			
4/20/2015 13:00	3.53	20599.42	0.53
4/20/2015 13:01	3.50	20232.91	0.52
4/20/2015 13:02	3.69	20104.65	0.54
4/20/2015 13:03	3.62	20028.38	0.53
4/20/2015 13:04	4.41	20386.06	0.65
4/20/2015 13:05	5.24	20384.20	0.78
4/20/2015 13:06	5.24	19982.69	0.76
4/20/2015 13:07	5.24	20375.60	0.78
4/20/2015 13:08	5.24	20383.16	0.78
4/20/2015 13:09	5.24	20433.21	0.78
4/20/2015 13:10	3.76	20408.87	0.56
4/20/2015 13:11	4.51	20403.46	0.67
4/20/2015 13:12	4.65	20231.14	0.68
4/20/2015 13:13	4.76	20248.50	0.70
4/20/2015 13:14	3.52	20220.72	0.52
4/20/2015 13:15	4.81	20200.55	0.71
4/20/2015 13:16	3.61	20211.35	0.53
4/20/2015 13:17	3.10	20187.05	0.46
4/20/2015 13:18	3.79	20158.33	0.56
4/20/2015 13:19	4.62	20029.99	0.67
4/20/2015 13:20	4.30	20209.77	0.63
	4.31	20258.09	0.63



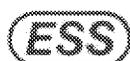
TW-18 Outlet

	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPV AI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average FI_94069.PV - Average			
4/20/2015 13:30	5.37	20512.77	0.80
4/20/2015 13:31	4.70	20427.88	0.70
4/20/2015 13:32	3.51	20283.67	0.52
4/20/2015 13:33	4.82	20345.33	0.71
4/20/2015 13:34	4.38	20580.30	0.66
4/20/2015 13:35	4.62	20153.11	0.68
4/20/2015 13:36	4.13	20288.71	0.61
4/20/2015 13:37	3.72	20182.65	0.55
4/20/2015 13:38	4.11	20172.82	0.60
4/20/2015 13:39	4.14	20293.17	0.61
4/20/2015 13:40	3.40	19986.83	0.49
4/20/2015 13:41	4.15	20008.11	0.60
4/20/2015 13:42	4.31	20199.50	0.63
4/20/2015 13:43	3.96	20154.99	0.58
4/20/2015 13:44	5.02	20042.23	0.73
4/20/2015 13:45	4.89	20252.99	0.72
4/20/2015 13:46	4.33	20301.56	0.64
4/20/2015 13:47	4.13	20398.91	0.61
4/20/2015 13:48	4.66	20251.85	0.69
4/20/2015 13:49	3.66	20098.11	0.54
4/20/2015 13:50	4.52	20187.27	0.66
	4.31	20243.94	0.64



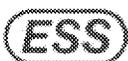
TW-18 Outlet

	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPV AI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average FI_94069.PV - Average			
4/20/2015 14:00	4.95	20033.26	0.72
4/20/2015 14:01	4.63	19789.20	0.67
4/20/2015 14:02	5.16	19845.96	0.74
4/20/2015 14:03	4.08	19976.87	0.59
4/20/2015 14:04	3.76	20201.71	0.55
4/20/2015 14:05	3.35	20216.52	0.49
4/20/2015 14:06	3.35	19996.43	0.49
4/20/2015 14:07	3.35	20345.22	0.50
4/20/2015 14:08	3.35	19953.16	0.49
4/20/2015 14:09	3.56	20271.20	0.53
4/20/2015 14:10	4.64	19889.36	0.67
4/20/2015 14:11	5.31	20094.26	0.78
4/20/2015 14:12	4.69	20304.33	0.69
4/20/2015 14:13	3.84	20133.71	0.56
4/20/2015 14:14	4.15	20238.01	0.61
4/20/2015 14:15	5.06	20099.05	0.74
4/20/2015 14:16	4.84	20298.01	0.71
4/20/2015 14:17	4.96	20133.82	0.73
4/20/2015 14:18	4.35	20187.87	0.64
4/20/2015 14:19	5.67	20208.38	0.83
4/20/2015 14:20	3.69	20137.97	0.54
	4.32	20112.11	0.63



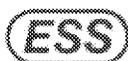
TW-18 Outlet

	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPV AI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average FI_94069.PV - Average			
4/20/2015 14:30	4.85	20270.80	0.72
4/20/2015 14:31	5.01	20003.77	0.73
4/20/2015 14:32	3.99	20271.49	0.59
4/20/2015 14:33	4.00	20020.81	0.58
4/20/2015 14:34	3.99	20050.34	0.58
4/20/2015 14:35	5.27	20200.89	0.77
4/20/2015 14:36	4.23	20117.95	0.62
4/20/2015 14:37	4.65	20167.97	0.68
4/20/2015 14:38	5.12	19970.36	0.74
4/20/2015 14:39	6.31	20173.67	0.93
4/20/2015 14:40	3.87	20351.09	0.57
4/20/2015 14:41	4.12	20323.18	0.61
4/20/2015 14:42	4.03	20381.85	0.60
4/20/2015 14:43	4.64	20261.43	0.68
4/20/2015 14:44	4.80	20145.73	0.70
4/20/2015 14:45	4.40	20343.05	0.65
4/20/2015 14:46	3.98	20128.15	0.58
4/20/2015 14:47	4.54	20118.04	0.66
4/20/2015 14:48	5.82	20165.47	0.85
4/20/2015 14:49	3.94	20026.81	0.57
4/20/2015 14:50	3.83	20348.81	0.57
	4.54	20182.94	0.67



TW-18 Outlet

	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPV AI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average FI_94069.PV - Average			
4/20/2015 15:00	3.58	20551.51	0.53
4/20/2015 15:01	3.59	20253.28	0.53
4/20/2015 15:02	4.74	20120.95	0.69
4/20/2015 15:03	5.18	20245.89	0.76
4/20/2015 15:04	4.39	20109.11	0.64
4/20/2015 15:05	4.67	20057.22	0.68
4/20/2015 15:06	4.67	20218.81	0.69
4/20/2015 15:07	4.67	20093.42	0.68
4/20/2015 15:08	4.67	20216.87	0.69
4/20/2015 15:09	4.48	20464.01	0.67
4/20/2015 15:10	3.84	20333.40	0.57
4/20/2015 15:11	5.16	20463.66	0.77
4/20/2015 15:12	5.55	20102.46	0.81
4/20/2015 15:13	6.36	20247.94	0.94
4/20/2015 15:14	5.12	20119.53	0.75
4/20/2015 15:15	4.97	20347.61	0.74
4/20/2015 15:16	5.61	20292.40	0.83
4/20/2015 15:17	5.66	20061.94	0.83
4/20/2015 15:18	5.46	20442.62	0.81
4/20/2015 15:19	5.72	20374.24	0.85
4/20/2015 15:20	4.91	20237.99	0.72
	4.90	20254.99	0.72

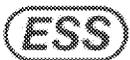


TW-18 Outlet

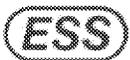
	NOx ppm	Flow Rate SCFM	NOx lb/hr
=PHDGetData("HPVAI_94013_NOX.PV FI_94069.PV			
Timestamp_NOX.PV - Average FI_94069.PV - Average			
4/20/2015 15:30	5.82	20269.81	0.86
4/20/2015 15:31	4.17	20277.85	0.62
4/20/2015 15:32	4.89	20371.36	0.72
4/20/2015 15:33	5.32	20104.88	0.78
4/20/2015 15:34	5.23	20243.95	0.77
4/20/2015 15:35	5.33	20256.41	0.79
4/20/2015 15:36	5.61	20160.75	0.82
4/20/2015 15:37	5.55	20398.86	0.82
4/20/2015 15:38	4.91	20288.77	0.72
4/20/2015 15:39	5.00	20294.20	0.74
4/20/2015 15:40	5.62	20197.61	0.82
4/20/2015 15:41	4.90	20198.12	0.72
4/20/2015 15:42	5.37	20035.36	0.78
4/20/2015 15:43	4.72	20329.32	0.70
4/20/2015 15:44	4.65	20181.37	0.68
4/20/2015 15:45	4.73	20199.01	0.69
4/20/2015 15:46	4.99	20290.92	0.74
4/20/2015 15:47	5.79	20291.19	0.86
4/20/2015 15:48	4.29	20154.78	0.63
4/20/2015 15:49	5.10	20411.34	0.76
4/20/2015 15:50	4.55	20135.56	0.67
	5.07	20242.45	0.75



MAY 11, 2015



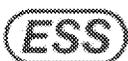
TW-18 INLET



AI_94012.PV
AI_94012B.PV

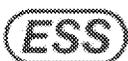
TW-18 Inlet

R1	5/11/2015 13:50	5/11/2015 14:10
R2	5/11/2015 14:20	5/11/2015 14:40
R3	5/11/2015 14:50	5/11/2015 15:10
R4	5/11/2015 15:20	5/11/2015 15:40
R5	5/11/2015 15:50	5/11/2015 16:10
R6	5/11/2015 16:20	5/11/2015 16:40
R7	5/11/2015 16:50	5/11/2015 17:10
R8	5/11/2015 17:20	5/11/2015 17:40
R9	5/11/2015 17:50	5/11/2015 18:10



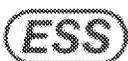
TW-18 Inlet

	NOx ppm AI_94012.PV	NOx ppm AI_94012B.PV
Timestamp	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 13:50	1928.38	2012.15
5/11/2015 13:51	1947.69	2035.77
5/11/2015 13:52	1951.88	2049.16
5/11/2015 13:53	1955.27	2043.23
5/11/2015 13:54	1955.12	2047.45
5/11/2015 13:55	1946.01	2020.25
5/11/2015 13:56	1917.52	1982.83
5/11/2015 13:57	1912.30	1987.25
5/11/2015 13:58	1912.00	1991.69
5/11/2015 13:59	1933.89	2039.24
5/11/2015 14:00	1928.72	2020.38
5/11/2015 14:01	1935.93	2031.95
5/11/2015 14:02	1935.54	2019.03
5/11/2015 14:03	1936.89	2023.44
5/11/2015 14:04	1932.04	2022.12
5/11/2015 14:05	1951.51	2058.20
5/11/2015 14:06	1972.32	2091.40
5/11/2015 14:07	1989.57	2106.91
5/11/2015 14:08	2000.45	2124.82
5/11/2015 14:09	2004.01	2117.56
5/11/2015 14:10	2014.50	2127.32
	1950.55	2045.34



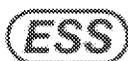
TW-18 Inlet

	NOx ppm AI_94012.PV	NOx ppm AI_94012B.PV
Timestamp	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 14:20	2055.99	2159.23
5/11/2015 14:21	2044.97	2144.48
5/11/2015 14:22	2038.42	2139.65
5/11/2015 14:23	2018.79	2105.54
5/11/2015 14:24	2023.45	2129.67
5/11/2015 14:25	2020.79	2118.17
5/11/2015 14:26	2028.17	2131.31
5/11/2015 14:27	2031.34	2135.78
5/11/2015 14:28	2043.59	2157.48
5/11/2015 14:29	2040.65	2141.77
5/11/2015 14:30	2057.04	2181.26
5/11/2015 14:31	2070.62	2192.88
5/11/2015 14:32	2080.60	2195.90
5/11/2015 14:33	2065.70	2160.07
5/11/2015 14:34	2039.30	2127.54
5/11/2015 14:35	2016.62	2093.34
5/11/2015 14:36	2020.66	2129.44
5/11/2015 14:37	2023.80	2125.20
5/11/2015 14:38	2031.72	2138.17
5/11/2015 14:39	2020.08	2101.18
5/11/2015 14:40	2014.80	2111.05
	2037.48	2139.01



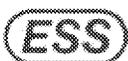
TW-18 Inlet

Timestamp	NOx ppm	NOx ppm
	AI_94012.PV	AI_94012B.PV
	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 14:50	2018.93	2129.87
5/11/2015 14:51	2043.89	2174.20
5/11/2015 14:52	2064.10	2191.71
5/11/2015 14:53	2077.33	2198.67
5/11/2015 14:54	2058.49	2159.13
5/11/2015 14:55	2058.62	2158.92
5/11/2015 14:56	2053.43	2153.31
5/11/2015 14:57	2058.32	2170.25
5/11/2015 14:58	2054.37	2160.27
5/11/2015 14:59	2054.90	2159.40
5/11/2015 15:00	2041.32	2128.57
5/11/2015 15:01	2033.43	2121.56
5/11/2015 15:02	2032.93	2127.17
5/11/2015 15:03	2037.73	2134.46
5/11/2015 15:04	2031.39	2137.32
5/11/2015 15:05	2031.37	2132.64
5/11/2015 15:06	2029.91	2120.41
5/11/2015 15:07	2035.81	2141.87
5/11/2015 15:08	2025.83	2116.90
5/11/2015 15:09	2023.50	2119.06
5/11/2015 15:10	2031.27	2133.70
	2042.71	2146.16



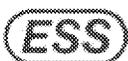
TW-18 Inlet

	NOx ppm	NOx ppm
	AI_94012.PV	AI_94012B.PV
Timestamp	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 15:20	2034.96	2136.72
5/11/2015 15:21	2025.05	2106.57
5/11/2015 15:22	1996.30	2071.17
5/11/2015 15:23	1989.04	2078.33
5/11/2015 15:24	1992.51	2093.62
5/11/2015 15:25	2013.04	2131.23
5/11/2015 15:26	2015.29	2130.61
5/11/2015 15:27	2027.19	2148.38
5/11/2015 15:28	2024.92	2133.26
5/11/2015 15:29	2018.39	2119.98
5/11/2015 15:30	2017.62	2123.75
5/11/2015 15:31	2024.37	2136.83
5/11/2015 15:32	2033.96	2159.75
5/11/2015 15:33	2016.99	2117.31
5/11/2015 15:34	1999.97	2091.32
5/11/2015 15:35	1997.83	2089.45
5/11/2015 15:36	1999.94	2094.02
5/11/2015 15:37	1995.63	2090.53
5/11/2015 15:38	1985.79	2078.32
5/11/2015 15:39	1968.15	2051.31
5/11/2015 15:40	1958.82	2043.38
	2006.46	2105.99



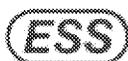
TW-18 Inlet

	NOx ppm	NOx ppm
	AI_94012.PV	AI_94012B.PV
Timestamp	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 15:50	2004.59	2108.56
5/11/2015 15:51	2029.22	2143.24
5/11/2015 15:52	2020.08	2119.32
5/11/2015 15:53	2018.84	2107.26
5/11/2015 15:54	2000.54	2087.73
5/11/2015 15:55	1992.01	2076.31
5/11/2015 15:56	1977.66	2057.85
5/11/2015 15:57	1977.33	2063.28
5/11/2015 15:58	1969.27	2057.85
5/11/2015 15:59	1968.01	2052.28
5/11/2015 16:00	1950.51	2017.91
5/11/2015 16:01	1936.64	2006.99
5/11/2015 16:02	1916.44	1986.68
5/11/2015 16:03	1919.06	1994.08
5/11/2015 16:04	1921.53	1993.84
5/11/2015 16:05	1924.98	2010.95
5/11/2015 16:06	1924.53	2002.91
5/11/2015 16:07	1935.63	2027.54
5/11/2015 16:08	1927.17	2007.78
5/11/2015 16:09	1934.42	2028.59
5/11/2015 16:10	1937.51	2024.99
	1961.24	2046.47



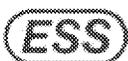
TW-18 Inlet

	NOx ppm AI_94012.PV	NOx ppm AI_94012B.PV
Timestamp	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 16:20	1851.64	1914.19
5/11/2015 16:21	1860.25	1934.44
5/11/2015 16:22	1857.17	1936.09
5/11/2015 16:23	1875.19	1971.03
5/11/2015 16:24	1900.80	2005.91
5/11/2015 16:25	1908.58	2000.00
5/11/2015 16:26	1919.81	2025.10
5/11/2015 16:27	1931.89	2027.61
5/11/2015 16:28	1956.83	2064.53
5/11/2015 16:29	1967.83	2087.60
5/11/2015 16:30	1981.95	2096.74
5/11/2015 16:31	1969.10	2058.59
5/11/2015 16:32	2488.05	2068.42
5/11/2015 16:33	2341.36	2053.13
5/11/2015 16:34	1985.05	2070.49
5/11/2015 16:35	1980.36	2048.20
5/11/2015 16:36	2004.56	2108.58
5/11/2015 16:37	2014.92	2108.36
5/11/2015 16:38	2038.78	2146.11
5/11/2015 16:39	2045.71	2133.71
5/11/2015 16:40	2040.48	2119.24
	1996.21	2046.57



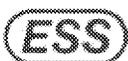
TW-18 Inlet

Timestamp	NOx ppm	NOx ppm
	AI_94012.PV	AI_94012B.PV
	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 16:50	2042.89	2122.13
5/11/2015 16:51	2043.75	2125.25
5/11/2015 16:52	2047.96	2133.90
5/11/2015 16:53	2046.93	2121.31
5/11/2015 16:54	2042.22	2122.55
5/11/2015 16:55	2060.24	2147.82
5/11/2015 16:56	2073.59	2183.28
5/11/2015 16:57	2097.82	2208.55
5/11/2015 16:58	2103.24	2208.90
5/11/2015 16:59	2086.87	2166.19
5/11/2015 17:00	2070.25	2139.75
5/11/2015 17:01	2051.01	2114.58
5/11/2015 17:02	2030.69	2095.44
5/11/2015 17:03	2022.01	2081.89
5/11/2015 17:04	2019.09	2086.88
5/11/2015 17:05	2021.45	2087.28
5/11/2015 17:06	2024.55	2097.14
5/11/2015 17:07	2027.30	2092.17
5/11/2015 17:08	2013.04	2066.70
5/11/2015 17:09	2014.52	2076.60
5/11/2015 17:10	2007.88	2069.55
	2045.11	2121.33



TW-18 Inlet

	NOx ppm AI_94012.PV	NOx ppm AI_94012B.PV
Timestamp	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 17:20	2030.79	2169.96
5/11/2015 17:21	2058.91	2153.54
5/11/2015 17:22	2050.35	2147.35
5/11/2015 17:23	2051.01	2144.59
5/11/2015 17:24	2047.34	2148.43
5/11/2015 17:25	2044.32	2143.18
5/11/2015 17:26	2040.43	2146.78
5/11/2015 17:27	2034.49	2125.83
5/11/2015 17:28	2018.27	2097.11
5/11/2015 17:29	2004.51	2077.46
5/11/2015 17:30	1987.69	2054.85
5/11/2015 17:31	1986.10	2072.26
5/11/2015 17:32	2002.37	2101.97
5/11/2015 17:33	2017.99	2119.29
5/11/2015 17:34	2027.35	2123.78
5/11/2015 17:35	2037.10	2148.23
5/11/2015 17:36	2052.37	2168.03
5/11/2015 17:37	2063.66	2169.25
5/11/2015 17:38	2085.10	2199.57
5/11/2015 17:39	2091.13	2202.73
5/11/2015 17:40	2085.91	2196.20
	2038.91	2138.59

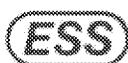


TW-18 Inlet

	NOx ppm	NOx ppm
	AI_94012.PV	AI_94012B.PV
Timestamp	AI_94012.PV - Average	AI_94012B.PV - Average
5/11/2015 17:50	2087.19	2193.60
5/11/2015 17:51	2077.83	2183.15
5/11/2015 17:52	2073.84	2190.76
5/11/2015 17:53	2086.82	2208.39
5/11/2015 17:54	2085.37	2212.16
5/11/2015 17:55	2092.01	2225.11
5/11/2015 17:56	2098.00	2218.40
5/11/2015 17:57	2097.25	2214.48
5/11/2015 17:58	2084.60	2192.55
5/11/2015 17:59	2072.29	2172.62
5/11/2015 18:00	2064.51	2168.61
5/11/2015 18:01	2055.84	2156.40
5/11/2015 18:02	2054.83	2163.44
5/11/2015 18:03	2058.16	2168.60
5/11/2015 18:04	2059.41	2169.30
5/11/2015 18:05	2064.75	2185.79
5/11/2015 18:06	2080.33	2200.28
5/11/2015 18:07	2081.15	2195.65
5/11/2015 18:08	2080.72	2200.01
5/11/2015 18:09	2091.41	2207.79
5/11/2015 18:10	2090.91	2204.73
	2077.96	2191.99



APPENDIX D CALIBRATION DATA

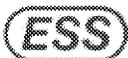


**HONEYWELL - HOPEWELL, VA
CALIBRATION DATA- TW-18 INLET**

Date :			Cylinder Value		Analyzer Response	Absolute Difference	Percent Difference
Gas :	O2						
Span :	20.990	Zero Gas	0.000	✓	0.037	0.037	0.176
		Mid-range Gas	11.980	✓	11.960	0.020	0.095
		High-range Gas	20.990	✓	21.020	0.030	0.143
Date :	4/20/2015		Cylinder Value		Analyzer Response	Absolute Difference	Percent Difference
Gas :	CO2						
Span :	15.910	Zero Gas	0.000	✓	0.034	0.034	0.214
		Mid-range Gas	8.006	✓	8.001	0.005	0.031
		High-range Gas	15.910	✓	15.917	0.007	0.044
Date :	4/20/2015		Cylinder Value		Analyzer Response	Absolute Difference	Percent Difference
Gas :	NOX						
Span :	4659.000	Zero Gas	0.000	✓	0.840	0.840	0.018
		Mid-range Gas	2453.000	✓	2449.000	4.000	0.086
		High-range Gas	4659.000	✓	4664.000	5.000	0.107

Converter Efficiency Check

			Response (sec)	Up	Down
15:56	49.75	NO2 (PPM):	53.09	96	77
15:57	50.12			94	75
15:58	50.73			93	73
AVERAGE	50.200				
Conv. Eff.=	94.6 %	✓			

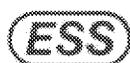


**HONEYWELL - HOPEWELL, VA
CALIBRATION DATA TW-18 OUTLET**

Date :	4/20/2015		Cylinder Value	Analyzer Response	Absolute Difference	Percent Difference
Gas :	O2					
Span :	20.990	Zero Gas	0.000	0.025	0.025	0.119
		Mid-range Gas	11.980	11.950	0.030	0.143
		High-range Gas	20.990	20.940	0.050	0.238
Date :	4/20/2015		Cylinder Value	Analyzer Response	Absolute Difference	Percent Difference
Gas :	CO2					
Span :	15.910	Zero Gas	0.000	0.039	0.039	0.245
		Mid-range Gas	8.006	8.011	0.005	0.031
		High-range Gas	15.910	15.914	0.004	0.025
Date :	4/20/2015		Cylinder Value	Analyzer Response	Absolute Difference	Percent Difference
Gas :	NOX					
Span :	24.930	Zero Gas	0.000	0.072	0.072	0.289
		Mid-range Gas	12.180	12.187	0.007	0.028
		High-range Gas	24.930	24.990	0.060	0.241

Converter Efficiency Check

			Response (sec)	Up	98	Down	77
					96		75
					94		74
15:55	48.77	NO2 (PPM):	53.09				
15:56	49.43						
15:57	49.76						
AVERAGE	49.32						
Conv. Eff.=	92.9 %						



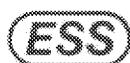
HONEYWELL - HOPEWELL, VA
 CALIBRATION DATA- TW-18 INLET

Date :	5/11/2015	Cylinder Value	Analyzer Response	Absolute Difference	Percent Difference
Gas :	NOX	Zero Gas	0.000	1.132	0.026
Span :	4398.000	Mid-range Gas	2366.000	2370.000	0.091
		High-range Gas	4398.000	4393.000	0.114

Response Time	Up	Down	(time in seconds)
	97	78	
	95	77	
	92	75	

Converter Efficiency Check

18:21	49.55 NO2 (PPM)	53.09 ppm
18:22	49.76	
18:23	50.29	
AVERAGE	49.867	
Conv. Eff.=	93.9 %	





Airgas Specialty Gases

630 United Drive
Durham, NC 27713
919-544-3773 Fax: 919-544-3774
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E03NI80E15A1140 Reference Number: 122-124420923-1
Cylinder Number: CC64254 Cylinder Volume: 149.9 CF
Laboratory: ASG - Durham - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B22014 Valve Outlet: 590
Gas Code: CO2,O2,BALN Certification Date: Feb 24, 2014

Expiration Date: Feb 24, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
CARBON DIOXIDE	8.000 %	8.006 %	G1	+/- 0.6% NIST Traceable	02/24/2014
OXYGEN	12.00 %	11.98 %	G1	+/- 0.4% NIST Traceable	02/24/2014
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	12061348	CC360808	11.002 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 11, 2018
NTRM	09061416	CC273522	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA510 CO2 42399380022	Nondispersive Infrared (NDIR)	Feb 07, 2014
Horiba MPA510 O2 41499150042	Paramagnetic	Feb 07, 2014

Triad Data Available Upon Request

Notes:

AS Williams

Approved for Release





CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Airgas Specialty Gases

630 United Drive
Durham, NC 27713
919-544-3773 Fax: 919-544-3774
www.airgas.com

Part Number:	E03NI73E15A4BQ4	Reference Number:	122-124453079-1
Cylinder Number:	CC454142	Cylinder Volume:	155.2 CF
Laboratory:	ASG - Durham - NC	Cylinder Pressure:	2015 PSIG
PGVP Number:	B22014	Valve Outlet:	590
Gas Code:	CO2,O2,BALN	Certification Date:	Sep 10, 2014

Expiration Date: Sep 10, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

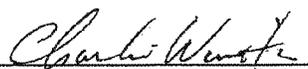
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

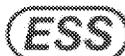
ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	11.00 %	11.21 %	G1	+/- 1.0% NIST Traceable	09/10/2014
CARBON DIOXIDE	16.00 %	15.91 %	G1	+/- 0.6% NIST Traceable	09/10/2014
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09060211	CC262370	9.961 % OXYGEN/NITROGEN	+/- 0.3%	Nov 08, 2018
NTRM	12061551	CC354889	19.87 % CARBON DIOXIDE/NITROGEN	+/- 0.6%	Jan 27, 2018

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba VIA510 CO2 2L6YXWY0	Nondispersive Infrared (NDIR)	Aug 28, 2014
Horiba MPA510 O2 41499150042	Paramagnetic	Aug 28, 2014

Triad Data Available Upon Request


 Approved for Release





Airgas Specialty Gases

630 United Drive
Durham, NC 27713
919-544-3773 Fax: 919-544-3774
www.airgas.com

CERTIFICATE OF ANALYSIS
Grade of Product: EPA Protocol

Part Number: E02NI79E15A0927 Reference Number: 122-124413623-1
Cylinder Number: XC021149B Cylinder Volume: 146.2 CF
Laboratory: ASG - Durham - NC Cylinder Pressure: 2015 PSIG
PGVP Number: B22014 Valve Outlet: 590
Gas Code: O2,BALN Certification Date: Jan 10, 2014

Expiration Date: Jan 10, 2022

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 800/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
OXYGEN	21.00 %	20.99 % ✓	G1	+/- 0.5% NIST Traceable	01/10/2014
NITROGEN	Balance				

CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	09061416	CC273522	22.53 % OXYGEN/NITROGEN	+/- 0.4%	Mar 08, 2019

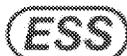
ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
Horiba MPA510 O2 41499150042	Paramagnetic	Jan 06, 2014

Triad Data Available Upon Request

Notes:

CS Williams

Approved for Release



CERTIFICATE OF ANALYSIS

Grade of Product: EPA Protocol

Part Number: E02NI99E15A0395	Reference Number: 122-124452478-1
Cylinder Number: CC310355	Cylinder Volume: 144.3 CF
Laboratory: ASG - Durham - NC	Cylinder Pressure: 2015 PSIG
PGVP Number: B22014	Valve Outlet: 660
Gas Code: NO,BALN	Certification Date: Sep 15, 2014

Expiration Date: Sep 15, 2017

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

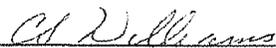
Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	12.00 PPM	12.18 PPM	✓ G1	+/- 1.4% NIST Traceable	09/08/2014, 09/15/2014
NITRIC OXIDE	12.00 PPM	12.18 PPM	G1	+/- 1.1% NIST Traceable	09/08/2014, 09/15/2014
NITROGEN	Balance				

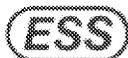
CALIBRATION STANDARDS					
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date
NTRM	13061107	CC403779	10.14 PPM NITRIC OXIDE/NITROGEN	+/- 1.0%	Feb 07, 2017
NTRM	13061107	CC403779 NOX	10.14 PPM NOx/NITROGEN	+/- 1.0%	Feb 07, 2017

ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
THERMO NO 42I-1308657345	Chemiluminescence	Aug 28, 2014
THERMO NOX 42I-1308657345	Chemiluminescence	Aug 28, 2014

Triad Data Available Upon Request



 Approved for Release



CERTIFICATE OF ANALYSIS Grade of Product: EPA Protocol

Part Number: E02NI99E15A0047	Reference Number: 122-124413634-1
Cylinder Number: CC413437	Cylinder Volume: 144.3 CF
Laboratory: ASG - Durham - NC	Cylinder Pressure: 2015 PSIG
PGVP Number: B22014	Valve Outlet: 660
Gas Code: NO,BALN	Certification Date: Jan 20, 2014

Expiration Date: Jan 20, 2017

Certification performed in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards (May 2012)" document EPA 600/R-12/531, using the assay procedures listed. Analytical Methodology does not require correction for analytical interference. This cylinder has a total analytical uncertainty as stated below with a confidence level of 95%. There are no significant impurities which affect the use of this calibration mixture. All concentrations are on a volume/volume basis unless otherwise noted.

Do Not Use This Cylinder below 100 psig, i.e. 0.7 megapascals.

ANALYTICAL RESULTS					
Component	Requested Concentration	Actual Concentration	Protocol Method	Total Relative Uncertainty	Assay Dates
NOX	25.00 PPM	24.93 PPM ✓	G1	+/- 1.4% NIST Traceable	01/13/2014, 01/20/2014
NITRIC OXIDE	25.00 PPM	24.93 PPM	G1	+/- 0.9% NIST Traceable	01/13/2014, 01/20/2014
NITROGEN	Balance				

CALIBRATION STANDARDS						
Type	Lot ID	Cylinder No	Concentration	Uncertainty	Expiration Date	
NTRM	12061628	CC344830	20.23 PPM NITRIC OXIDE/NITROGEN	+/- 0.9%	Apr 11, 2015	
NTRM	12061628	CC344830 NOX	20.28 PPM NOx/NITROGEN	+/- 0.9%	Apr 11, 2015	

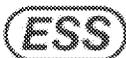
ANALYTICAL EQUIPMENT		
Instrument/Make/Model	Analytical Principle	Last Multipoint Calibration
THERMO NO 42I-1308857345	Chemiluminescence	Jan 09, 2014
THERMO NOX 42I-1308857345	Chemiluminescence	Jan 09, 2014

Triad Data Available Upon Request

Notes:

CS Williams

Approved for Release





Praxair Distribution Mid-Atlantic
 One Steel Road East,
 Morrisville, PA 19067
 Tel: (800) 638-6360 Fax: (215) 736 5240
 PGVP ID: F32012

DocNumber: 000000748

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

PDI WHSE SANFORD NC STORE
 1510 HAWKINS AVE
 SANFORD NC 273300

Praxair Order Number: 03762712
 Customer P. O. Number: CHEROKEE
 Customer Reference Number:

Fill Date: 7/31/2012
 Part Number: NJ NO24502E-AS
 Lot Number: 917221352
 Cylinder Style & Outlet: AS CGA 660
 Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	9/5/2020	NIST Traceable
Cylinder Number:	CC232086	Analytical Uncertainty:
2453.0 ppm	NITRIC OXIDE ✓	± 1 %
Balance	NITROGEN	

Certification Information: Certification Date: 9/5/2012 Term: 96 Months Expiration Date: 9/5/2020

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G1. Do Not Use this Standard if Pressure is less than 150 PSIG.

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: NITRIC OXIDE

Requested Concentration: 2450 ppm
 Certified Concentration: 2453.0 ppm
 Instrument Used: MKS 2031
 Analytical Method: FTIR
 Last Multipoint Calibration: 8/30/2012

Reference Standard Type: GMIS
 Ref. Std. Cylinder #: CC98825
 Ref. Std. Conc: 747 PPM
 Ref. Std. Traceable to SRM #: 1887B
 SRM Sample #: 41-K-S1
 SRM Cylinder #: FF31354

First Analysis Data:		Date:		8/29/2012	
Z:	-0.05	R:	749.19	C:	2463.5
Conc:	2456.1				
R:	749.8	Z:	-0.03	C:	2461
Conc:	2451.7				
Z:	0.03	C:	2460.2	R:	750.48
Conc:	2448.9				
UOM:	PPM	Mean Test Assay:	2452.3 PPM		

Second Analysis Data:		Date:		9/5/2012	
Z:	-0.01	R:	752.67	C:	2473.7
Conc:	2455				
R:	753.06	Z:	-0.05	C:	2475.1
Conc:	2455.0				
Z:	0.04	C:	2474.1	R:	753.38
Conc:	2453.3				
UOM:	PPM	Mean Test Assay:	2454.4 PPM		

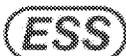
Analyzed by:

Meghan Powell for
 Dave Woodward

Certified by:

Judith Imperial
 Judith Imperial

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.





Praxair Distribution Mid-Atlantic
 145 Shimmersville Rd.
 Bethlehem, PA 18015
 Tel: (610) 317-1608 Fax: (610) 758 8382
 PGVP ID: F12011

DocNumber: 000013758

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

CHEROKEE INSTRUMENTS INC *
 901 BRIDGE ST
 FUQUAY VARINA NC 275260

Praxair Order Number: 17906415
 Customer P. O. Number: 11496
 Customer Reference Number:

Fill Date: 9/23/2011
 Part Number: NI NO4850E-AS
 Lot Number: 917126621
 Cylinder Style & Outlet: AS CGA 560
 Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	10/6/2019	NIST Traceable
Cylinder Number:	CC164225	Analytical Uncertainty:
4659 ppm	NITRIC OXIDE	± 1 %
Balance	NITROGEN	

NOx = 4659

NOx for Reference Only

Certification Information: Certification Date: 10/6/2011 Term: 96 Months Expiration Date: 10/6/2019

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G2. Do Not Use this Standard if Pressure is less than 150 PSIG.

PGVP ID# F12011

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: NITRIC OXIDE

Requested Concentration: 4850 ppm
 Certified Concentration: 4659 ppm
 Instrument Used: TECO MODEL 42C 42CHL-55533-304
 Analytical Method: CHEMILUMINESCENCE
 Last Multipoint Calibration: 9/15/2011

Reference Standard Type: GMS
 Ref. Std. Cylinder #: CC116816
 Ref. Std. Conc: 4086 PPM
 Ref. Std. Traceable to SRM #: 2631a
 SRM Sample #: 47-F-45
 SRM Cylinder #: CAL016138

First Analysis Data:		Date:		9/29/2011	
Z:	0	R:	4070	C:	4642
Conc:	4579.4				
R:	4060	Z:	0	C:	4614
Conc:	4651.2				
Z:	0	C:	4600	R:	4030
Conc:	4637.1				
UOM:	PPM	Mean Test Assay:	4659.9 PPM		

Second Analysis Data:		Date:		10/6/2011	
Z:	0	R:	4070	C:	4642.8
Conc:	4666.7				
R:	4060	Z:	0	C:	4626.6
Conc:	4654.4				
Z:	0	C:	4628.6	R:	4060
Conc:	4654.4				
UOM:	PPM	Mean Test Assay:	4659.2 PPM		

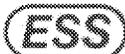
Analyzed by:

[Signature]
 Robin Morgan for

Certified by:

[Signature]
 Megha Patel for John Pribish

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.





Praxair Distribution Mid-Atlantic
 145 Shimersville Rd.
 Bethlehem, PA 18015
 Tel: (610) 317-1608 Fax: (610) 758 8382
 PGVP ID: F12012

DocNumber: 000018312

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

CHEROKEE INSTRUMENTS INC *
 901 BRIDGE ST
 FUQUAY VARINA NC 275260

Praxair Order Number: 20317939
 Customer P. O. Number: 11837
 Customer Reference Number:

Fill Date: 5/25/2012
 Part Number: NI ND450021E-AS
 Lot Number: 917214586
 Cylinder Style & Outlet: AS CGA 650
 Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	6/25/2020	NIST Traceable
Cylinder Number:	CC311289	Analytical Uncertainty:
4398 ppm	NITRIC OXIDE	± 1 %
Balance	NITROGEN	

NOx = 4398 ✓

NOx for Reference Only

Certification Information: Certification Date: 6/25/2012 Term: 96 Months Expiration Date: 6/25/2020

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G2. Do Not Use this Standard if Pressure is less than 150 PSIG.

PGVP ID#F12012

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: NITRIC OXIDE

Requested Concentration: 4500 ppm
 Certified Concentration: 4398 ppm
 Instrument Used: TECO MODEL 42C 42CHL-55533-304
 Analytical Method: CHEMILUMINESCENCE
 Last Multipoint Calibration: 6/21/2012

Reference Standard Type: GMIS
 Ref. Std. Cylinder #: CC116816
 Ref. Std. Conc: 4086 PPM
 Ref. Std. Traceable to SRM #: 2E31a
 SRM Sample #: 47-F-45
 SRM Cylinder #: CAL016138

First Analysis Data:		Date: 6/15/2012	
Z: 0	R: 4070	C: 4362	Conc: 4382.7
R: 4070	Z: 0	C: 4368	Conc: 4408.9
Z: 0	C: 4375	R: 4060	Conc: 4395.8
UOM: PPM	Mean Test Assay: 4395.8 PPM		

Second Analysis Data:		Date: 6/25/2012	
Z: 0	R: 4120	C: 4438	Conc: 4411.6
R: 4110	Z: 0	C: 4425	Conc: 4399.1
Z: 0	C: 4425	R: 4100	Conc: 4399.1
UOM: PPM	Mean Test Assay: 4403.2 PPM		

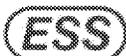
Analyzed by:

Robin Morgan

Certified by:

John Pribish

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.





Praxair Distribution Mid-Atlantic
 145 Shimersville Rd.
 Bethlehem, PA 18015
 Tel: (610) 317-1608 Fax: (610) 758 8382
 PGVP ID: F12012

DocNumber: 000016437

CERTIFICATE OF ANALYSIS / EPA PROTOCOL GAS

Customer & Order Information:

CHEROKEE INSTRUMENTS INC *
 901 BRIDGE ST
 FUQUAY VARINA NC 275260

Praxair Order Number: 19373088
 Customer P. O. Number: 11688
 Customer Reference Number:

Fill Date: 2/23/2012
 Part Number: NI NO2450ZE-AS
 Lot Number: 917205418
 Cylinder Style & Outlet: AS CGA 660
 Cylinder Pressure & Volume: 2000 psig 140 cu. ft.

Certified Concentration:

Expiration Date:	3/8/2020	NIST Traceable
Cylinder Number:	CC17424	Analytical Uncertainty:
2366 ppm	NITRIC OXIDE	± 1 %
Balance	NITROGEN	

NOx = 2366

NOx for Reference Only

Certification Information: Certification Date: 3/8/2012 Term: 96 Months Expiration Date: 3/8/2020

This cylinder was certified according to the 1997 EPA Traceability Protocol, Document #EPA-600/R-97/121, using Procedure G1. Do Not Use this Standard if Pressure is less than 150 PSIG.

PGVP ID#F12012

Analytical Data:

(R=Reference Standard, Z=Zero Gas, C=Gas Candidate)

1. Component: NITRIC OXIDE

Requested Concentration: 2450 ppm
 Certified Concentration: 2366 ppm
 Instrument Used: TECO MODEL 421 0936539561
 Analytical Method: CHEMILUMINESCENCE
 Last Multipoint Calibration: 2/16/2012

Reference Standard Type: GMIS
 Ref. Std. Cylinder #: CC6856
 Ref. Std. Conc: 2367 PPM
 Ref. Std. Traceable to SRM #: 2631a
 SRM Sample #: 47-F-52
 SRM Cylinder #: CAL016100

First Analysis Data:		Date:		3/1/2012	
Z:	0	R:	2400	C:	2380
Conc:	2373.6	Z:	0	C:	2370
Conc:	2363.7	R:	2350	C:	2353.7
Z:	0	C:	2360	R:	2350
Conc:	2353.7				
UOM:	PPM	Mean Test Assay:	2363.7 PPM		

Second Analysis Data:		Date:		3/8/2012	
Z:	0	R:	2420	C:	2420
Conc:	2376.8	Z:	0	C:	2410
Conc:	2387	R:	2400	C:	2400
Z:	0	C:	2400	R:	2400
Conc:	2357.2				
UOM:	PPM	Mean Test Assay:	2367 PPM		

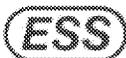
Analyzed by:

Michelle Kostik
 for

Certified by:

Robin Morgan

Information contained herein has been prepared at your request by qualified experts within Praxair Distribution, Inc. While we believe that the information is accurate within the limits of the analytical methods employed and is complete to the extent of the specific analyses performed, we make no warranty or representation as to the suitability of the use of the information for any purpose. The information is offered with the understanding that any use of the information is at the sole discretion and risk of the user. In no event shall the liability of Praxair Distribution, Inc., arising out of the use of the information contained herein exceed the fee established for providing such information.





Airgas Specialty Gases
630 United Drive
Durham, NC 27713
919-544-3773 Fax: 919-544-3774
www.airgas.com

CERTIFICATE OF ANALYSIS

Grade of Product: CERTIFIED STANDARD-SPEC

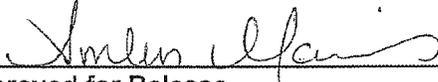
Part Number: X02AI99C15A0PY6 Reference Number: 122-124348171-2
Cylinder Number: CC-195701 Cylinder Volume: 146.2 Cubic Feet
Laboratory: ASG - Durham - NC Cylinder Pressure: 2015 PSIG
Analysis Date: Dec 12, 2012 Valve Outlet: 660
Lot Number: 122-124348171-2

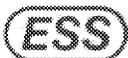
Product composition verified by direct comparison to calibration standards traceable to N.I.S.T. weights and/or N.I.S.T. Gas Mixture reference materials.

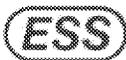
ANALYTICAL RESULTS

Component	Requested Concentration	Actual Concentration (Mole %)	Analytical Uncertainty
NITROGEN DIOXIDE	55.00 PPM	53.09 PPM ✓	+/- 2%
AIR	Balance		

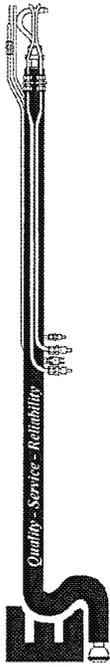
Notes: ANW, PART # 719245


Approved for Release





DRY GAS METER CALIBRATION USING CRITICAL ORIFICES



- 1) Select three critical orifices to calibrate the dry gas meter which bracket the expected operating range.
- 2) Record barometric pressure before and after calibration procedure.
- 3) Run at maximum attainable vacuum (open coarse valve, close fine valve) for period of 5 minutes minimum; for large orifice up to 10 minutes for smallest orifice.
- 4) Record readings in outlined boxes below, other columns are automatically calculated.

DATE: 12/30/2014 METER SERIAL #: 28547 CRITICAL ORIFICE SET SERIAL #: 1314

METER BOX #: S-39

INITIAL 30.25 FINAL 30.25 AVG (P_{bar}) 30.25

IF Y VARIATION EXCEEDS 2.00%, ORIFICE SHOULD BE RECALIBRATED

ORIFICE #	RUN #	K'	TESTED VACUUM (in Hg)	DGM READINGS (FT ²)		TEMPERATURES °F		ELAPSED TIME (MIN)	DGM ΔH (in H ₂ O)	(1) V _m (STD)	(2) V _{cr} (STD)	(3) Y	VARIATION (%)			
				INITIAL	FINAL	NET (V _m)	AMBIENT							DGM INLET	DGM OUTLET	DGM AVG
17	1	0.4547	20	735.589	732.40	5.811	42	46	46	47	46	45.25	6.1452	6.1409	0.9993	
	2	0.4547	20	732.40	738.205	5.805	42	46	47	47	47	46.75	6.1328	6.1409	1.0013	
	3	0.4547	20	738.205	744.014	5.809	43	47	46	47	48	47	47	6.1340	6.1348	1.0001
19	1	0.5283	18	744.588	751.310	6.742	44	50	48	48	49	48.75	7.0998	7.1207	1.0029	-0.04
	2	0.5283	18	751.310	758.054	6.744	44	49	50	50	51	50	7.0845	7.1207	1.0051	
	3	0.5283	18	758.054	764.823	6.769	44	50	50	51	51	50.5	7.1038	7.1207	1.0024	
24	1	0.6680	16	557.556	565.114	8.558	44	48	48	49	50	48.75	9.0319	9.0037	0.9969	
	2	0.6680	16	565.114	574.561	8.547	45	50	50	49	50	46.75	9.0026	8.9948	0.9991	
	3	0.6680	16	574.561	583.222	8.551	45	50	50	50	51	50.25	9.0063	8.9948	0.9987	-0.24

AVG = 1.0035 0.28

AVG = 0.9962 -0.24

AVG DRY GAS METER CALIBRATION FACTOR, Y = 1.0007

USING THE CRITICAL ORIFICES AS CALIBRATION STANDARDS:
 The following equations are used to calculate the standard volumes of air passed through the DGM, V_m (std), and the critical orifice, V_{cr} (std), and

$$(1) V_m (std) = K_1 V_m \frac{P_{bar} + (\Delta H / 13.6)}{T_m} = \text{Net volume of gas sample passed through DGM, corrected to standard conditions}$$

$$(2) V_{cr} (std) = K' \sqrt{\frac{P_{bar} \theta}{T_{minb}}} = \text{Volume of gas sample passed through the critical orifice, corrected to standard conditions}$$

$$(3) Y = \frac{V_{cr} (std)}{V_m (std)} = \text{DGM calibration factor}$$

$K_1 = 17.64 \sqrt{\text{Rin. Hg (English)}} / 0.3853 \sqrt{\text{K/mm Hg (Metric)}}$
 $T_m = \text{Absolute DGM avg. temperature (°R - English, °K - Metric)}$
 $T_{minb} = \text{Absolute ambient temperature (°R - English, °K - Metric)}$
 $K' = \text{Average K' factor from Critical Orifice Calibration}$

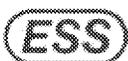
TYPE "S" PITOT TUBE CALIBRATION SUMMARY

PITOT TUBE CALIBRATIONS

PITOT TUBE ID	α_1	α_2	β_1	β_2	γ	θ	A, in	Z, in	W, in	PA, in	PB, in	Dt, in	DATE
Individual Pitot Tubes													
1V1	1.0	1.0	0.9	0.9	1.0	1.0	0.982	0.017	0.017	0.500	0.494	0.380	1/2/2015
3V1	1.2	1.2	0.8	0.8	1.0	0.8	0.980	0.017	0.014	0.475	0.472	0.380	1/2/2015
3V2	1.0	1.4	1.0	1.0	0.8	0.8	0.980	0.014	0.014	0.486	0.488	0.380	1/2/2015
4V1	1.0	1.3	0.8	0.8	0.8	1.0	0.980	0.014	0.017	0.486	0.488	0.381	1/2/2015
4V2	1.3	1.5	0.8	1.3	0.8	0.6	0.982	0.014	0.010	0.490	0.492	0.375	1/2/2015
5V1	1.2	1.2	1.2	1.3	1.0	0.8	0.988	0.017	0.014	0.492	0.492	0.379	1/2/2015
5V2	1.2	1.4	1.3	1.0	0.7	0.8	0.985	0.012	0.014	0.502	0.501	0.378	1/2/2015
6V1	1.6	1.3	1.0	1.3	0.8	0.7	0.983	0.014	0.012	0.496	0.494	0.378	1/2/2015
6V2	1.6	1.2	1.0	1.2	1.0	0.7	0.978	0.017	0.012	0.495	0.494	0.378	1/2/2015
7V1	1.1	0.9	1.0	1.5	1.2	0.8	0.982	0.021	0.014	0.485	0.484	0.378	1/2/2015
9V1	1.1	0.9	0.6	0.8	0.7	1.0	0.988	0.012	0.017	0.487	0.483	0.378	1/2/2015
9V3	1.2	1.0	0.6	0.8	0.7	1.0	0.988	0.012	0.017	0.487	0.483	0.378	1/2/2015
9V4	0.9	1.0	1.2	0.8	1.3	1.3	0.787	0.018	0.018	0.494	0.492	0.256	1/2/2015
10V1	0.8	1.0	0.9	0.8	1.0	1.0	0.820	0.014	0.014	0.494	0.492	0.258	1/2/2015
12V1	0.9	1.2	0.9	0.8	1.0	1.0	0.880	0.015	0.015	0.494	0.492	0.256	1/2/2015
12V2	1.0	1.0	1.0	1.0	1.1	0.7	0.975	0.019	0.012	0.482	0.484	0.262	1/2/2015
15V1	1.3	1.0	1.3	1.2	1.0	0.8	0.982	0.017	0.014	0.498	0.496	0.380	1/2/2015

Probes Mounted W/Electronic Protractors (RATA dedicated)

S2GA	0.8	1.0	0.5	1.2	0.8	0.8	0.972	0.014	0.014	0.499	0.498	0.373	1/2/2015
S2GB	0.5	0.3	0.5	1.0	0.2	0.3	0.980	0.003	0.005	0.494	0.495	0.373	1/2/2015
S10-06	0.4	0.9	0.6	1.2	0.4	0.5	0.980	0.007	0.009	0.497	0.495	0.375	1/2/2015
12VSA	0.6	0.8	0.5	0.8	0.4	0.4	0.980	0.007	0.007	0.498	0.496	0.375	1/2/2015
S-2005	0.6	0.4	0.4	0.4	0.2	0.0	0.978	0.003	0.000	0.496	0.496	0.373	1/2/2015



Thermocouple Calibrations

ID	CAL DATE	CAL SOURCE	REF TEMP, F	TC TEMP, F	DIFF, %
DGM S-25	1/2/2015	POINT 1	32	32	0.00
		POINT 2	50	51	-0.20
		POINT 3	212	212	0.00
		POINT 4	500	500	0.00
DGM S-27	1/2/2015	POINT 1	32	32	0.00
		POINT 2	50	50	0.00
		POINT 3	212	213	-0.15
		POINT 4	500	500	0.00
DGM S-35	1/2/2015	POINT 1	32	32	0.00
		POINT 2	50	51	-0.20
		POINT 3	212	212	0.00
		POINT 4	500	500	0.00
DGM S-36	1/2/2015	POINT 1	32	32	0.00
		POINT 2	50	50	0.00
		POINT 3	212	212	0.00
		POINT 4	500	501	-0.10
DGM S-37	1/2/2015	POINT 1	32	32	0.00
		POINT 2	50	50	0.00
		POINT 3	212	211	0.15
		POINT 4	500	499	0.10
DGM S-38	1/2/2015	POINT 1	32	32	0.00
		POINT 2	50	49	0.20
		POINT 3	212	212	0.00
		POINT 4	500	500	0.00
DGM S-39	1/2/2015	POINT 1	32	31	0.20
		POINT 2	50	49	0.20
		POINT 3	212	212	0.00
		POINT 4	500	500	0.00
DGM 5042	1/2/2015	POINT 1	32	32	0.00
		POINT 2	50	50	0.00
		POINT 3	212	213	-0.15
		POINT 4	500	501	-0.10

CALIBRATION INSTRUMENT USED IS AN EXTECH INSTRUMENTS MODEL NO. 42312 (S/N 50000139) CALIBRATOR/THERMOMETER.



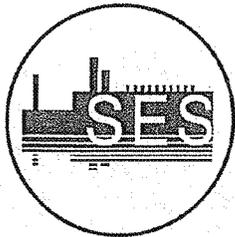
POST TEST THERMOCOUPLE CALIBRATIONS
June 8, 2015

THERM.ID	REFERENCE TEMPERATURE (F)	THERMOMETER READING (F)	PERCENT DIFFERENCE
S-30	82	83	-0.18
S-31	82	82	0.00
S-27	32	32	0.00
	82	83	-0.18
	212	213	-0.15
	250	250	0.00
	300	301	-0.13
S-35	32	32	0.00
	82	82	0.00
	212	213	-0.15
	250	250	0.00
	300	301	-0.13
S-36	32	33	-0.20
	82	83	-0.18
	212	212	0.00
	250	250	0.00
	300	300	0.00
S-37	32	32	0.00
	82	82	0.00
	212	212	0.00
	250	251	-0.14
	300	301	-0.13
S-38	32	32	0.00
	82	83	-0.18
	212	213	-0.15
	250	249	0.14
	300	299	0.13
S-39	32	33	-0.20
	82	83	-0.18
	212	213	-0.15
	250	251	-0.14
	300	300	0.00
5042	32	33	-0.20
	82	82	0.00
	212	213	-0.15
	250	250	0.00
	300	301	-0.13
S-40 (a)	32	32	0.00
	82	82	0.00
	212	212	0.00
	250	250	0.00
	300	300	0.00
S-40 (b)	32	33	-0.20
	82	82	0.00
	212	213	-0.15
	250	251	-0.14
	300	300	0.00

POST TEST PITOT TUBE CALIBRATIONS

PITOT TUBE ID	α_1	α_2	β_1	β_2	γ	θ	A, in	Z, in	W, in	PA, in	PB, in	Dt, in	DATE
3V1	0.9	0.9	1.0	1.0	1.0	1.0	0.823	0.014	0.014	0.494	0.494	0.258	6/8/2015
3P1	0.9	1.0	1.0	1.0	0.8	1.0	0.81	0.011	0.014	0.503	0.504	0.379	6/8/2015
3P2	0.8	1.1	1.0	0.8	0.8	1.0	0.99	0.014	0.017	0.505	0.506	0.378	6/8/2015
3V2	0.8	0.8	0.9	0.9	1.0	1.0	0.885	0.015	0.015	0.497	0.497	0.260	6/8/2015
4P1	0.9	1.0	1.0	1.0	1.0	1.0	0.99	0.017	0.017	0.502	0.502	0.383	6/8/2015
4V1	1.2	1.0	0.8	1.2	1.2	0.7	0.982	0.021	0.012	0.478	0.480	0.262	6/8/2015
4V2	1.2	1.1	1.1	1.4	1.2	1.0	0.980	0.021	0.017	0.498	0.498	0.380	6/8/2015
5P1	1.0	0.9	1.0	1.0	1.0	0.8	0.899	0.016	0.013	0.504	0.504	0.380	6/8/2015
5V1	1.3	1.2	1.1	1.3	1.0	0.8	0.988	0.017	0.014	0.482	0.482	0.379	6/8/2015
5V2	1.0	1.2	1.2	0.8	0.7	1.0	0.982	0.012	0.017	0.501	0.503	0.378	6/8/2015
6P1	0.9	1.0	0.8	0.8	1.0	0.8	0.9	0.016	0.013	0.501	0.503	0.380	6/8/2015
6P2	1.0	0.9	1.0	0.9	0.9	0.8	0.897	0.014	0.013	0.501	0.502	0.380	6/8/2015
7P1	0.9	1.0	0.8	0.8	1.0	0.9	0.998	0.017	0.016	0.504	0.501	0.381	6/8/2015
7P2	1.0	1.0	0.9	0.8	1.0	0.9	0.997	0.017	0.016	0.504	0.501	0.381	6/8/2015
8P1	0.8	0.9	0.9	0.9	0.9	0.9	0.995	0.016	0.016	0.503	0.503	0.380	6/8/2015
8P2	0.9	1.0	1.0	0.9	1.0	0.8	0.839	0.015	0.012	0.501	0.501	0.378	6/8/2015
9P1	1.0	1.0	0.9	1.0	0.9	1.0	0.757	0.012	0.013	0.502	0.502	0.378	6/8/2015
9P2	0.9	1.0	0.9	0.8	0.6	0.9	0.808	0.008	0.013	0.505	0.502	0.386	6/8/2015
9V3	1.0	0.9	0.6	0.9	0.7	1.0	0.988	0.012	0.017	0.468	0.468	0.379	6/8/2015
10P1	1.2	1.2	0.9	0.9	1.2	0.9	0.904	0.019	0.014	0.504	0.505	0.403	6/8/2015
10P2	1.2	1.4	1.2	1.1	1.1	1.0	0.900	0.017	0.016	0.501	0.502	0.402	6/8/2015
15V1	1.1	1.0	1.3	1.2	1.1	0.8	0.982	0.019	0.014	0.498	0.498	0.380	6/8/2015
15PR1	1.1	0.8	0.7	0.6	0.7	0.7	0.996	0.012	0.012	0.503	0.501	0.384	6/8/2015
15PR2	1.2	0.8	0.6	0.7	0.6	0.6	0.998	0.010	0.010	0.501	0.501	0.385	6/8/2015





Source Evaluation Society

P. O. Box 12124
Research Triangle Park
North Carolina 27709

January 9, 2013

Richard D. Sitter
Environmental Source Samplers, Inc.
436 Raleigh Street
Wilmington, NC 28412

Subject: Qualified Source Tester Application No. 2013-754
**Qualification Notice - Manual Gas Volume Measurements and Isokinetic
Particulate Sampling Methods
- Manual Gaseous Pollutants Source Sampling Methods**

Dear Mr. Sitter:

It is my pleasure to inform you that you have satisfied the requirements of the Source Evaluation Society Qualified Source Testing Individual program for the group exam(s) listed above. As a member of the successful candidates in this SES program, you should be proud of this distinction within the source emissions testing community. I am confident that you will continue to uphold the standards of technical excellence and ethical conduct embodied in the SES mission statement.

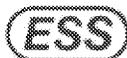
The enclosed Qualification Notice(s) and SES identification card are your permanent record of this achievement. This status is valid for the period shown on the Qualification Notice.

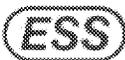
Congratulations on your achievement and I wish you continued success in your future endeavors. Please see attached a permission letter if you wish to have your information posted on the SES web site.

Sincerely yours,

Peter R. Westlin
SES QSTI/QSTO Review Committee Chairman

cc: Roy Owens, SES QSTI/QSTO Review Board Member
Glenn England, SES QSTI/QSTO Review Board Member
C. David Bagwell, SES QSTI/QSTO Review Board Member
Karen D. Kajiya-Mills, SES QSTI/QSTO Review Board Member
Peter S. Pakalnis, SES QSTI/QSTO Review Board Member
Gail Westlin, SES QSTI/QSTO Review Committee Administrator





SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

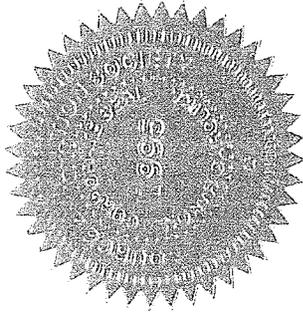
LET IT BE KNOWN THAT

RICHARD D. SITTER

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 9TH DAY OF JANUARY 2013 AND EFFECTIVE UNTIL JANUARY 8TH, 2018



Peter R. Westlin, QSTI/QSTO Review Board

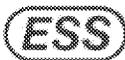
David Bagweff, QSTI/QSTO Review Board

APPLICATION NO. 2013-754

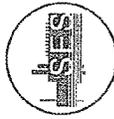
Peter S. Patakinis, QSTI/QSTO Review Board

Karen D. Kalliya-Mills, QSTI/QSTO Review Board

Glenn C. England, QSTI/QSTO Review Board



SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

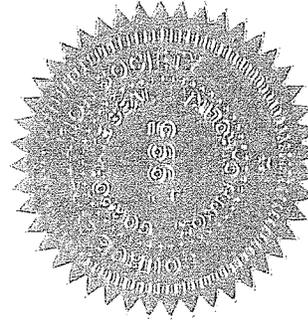
LET IT BE KNOWN THAT

RICHARD D. SITTER

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 9TH DAY OF JANUARY 2013 AND EFFECTIVE UNTIL JANUARY 8TH, 2018



Peter R. Westlin
Peter R. Westlin, QSTI/QSTO Review Board

A. A. ...
Peter S. Pakalnis, QSTI/QSTO Review Board

Greg F. Owens
Greg F. Owens, QSTI/QSTO Review Board

C. David Bagweiff
C. David Bagweiff, QSTI/QSTO Review Board

Karen D. Kajtja-Mills
Karen D. Kajtja-Mills, QSTI/QSTO Review Board

Glenn C. England
Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2013-754



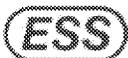
App. #
2013-754

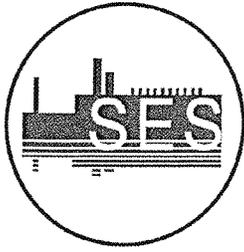
Source Evaluation Society
P. O. Box 12124
Research Triangle Park, NC 27709-2124

RICHARD D. SITTER

Qualified Source Testing Individual

**MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING
METHODS** - Effective Jan. 9, 2013 through Jan. 8, 2018 (exam date: 1/8/12)
MANUAL GAS SOURCE SAMPLING METHODS
- Effective Jan. 9, 2013 through Jan. 8, 2018 (exam date: 1/8/12)





Source Evaluation Society

P. O. Box 12124
Research Triangle Park
North Carolina 27709

March 15, 2011

Tiberiu Munteanu
Environmental Source Samplers, Inc.
436 Raleigh Street
Wilmington, NC 28412

Subject: Qualified Source Tester Application No. 2011-512
Qualification Notice - Manual Gaseous Pollutants Source Sampling Methods

Dear Mr. Munteanu:

It is my pleasure to inform you that you have satisfied the requirements of the Source Evaluation Society Qualified Source Test Individual program for group exam(s) listed above. As a member of the successful candidates in this SES program, you should be proud of this distinction within the source emissions testing community. I am confident that you will continue to uphold the standards of technical excellence and ethical conduct embodied in the SES mission statement.

The enclosed Qualification Notice(s) and SES identification card are your permanent record of this achievement. This status is valid for the period shown on the Qualification Notices.

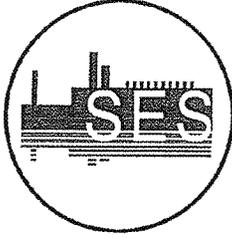
Congratulations on your achievement and I wish you continued success in your future endeavors. Please see attached a permission letter if you wish to have your information posted on the SES web site.

Sincerely yours,

Peter R. Westlin
SES QSTI/QSTO Review Committee Chairman

cc: Roy Owens, SES QSTI/QSTO Review Board Member
Glenn England, SES QSTI/QSTO Review Board Member
C. David Bagwell, SES QSTI/QSTO Review Board Member
Karen D. Kajiya-Mills, SES QSTI/QSTO Review Board Member
Peter S. Pakalnis, SES QSTI/QSTO Review Board Member
Gail Westlin, SES QSTI/QSTO Review Committee Administrator





Source Evaluation Society

P. O. Box 12124
Research Triangle Park
North Carolina 27709

July 31, 2012

Tiberiu Munteanu
Environmental Source Samplers, Inc.
436 Raleigh Street
Wilmington, NC 28412

Subject: Qualified Source Tester Application No. 2011-512
Qualification Notice - Gaseous Pollutants Instrumental Sampling Methods
(exam date: 1/20/12)

Dear Mr. Munteanu:

It is my pleasure to inform you that you have satisfied the requirements of the Source Evaluation Society Qualified Source Testing Individual program for group exam(s) listed above. As a member of the successful candidates in this SES program, you should be proud of this distinction within the source emissions testing community. I am confident that you will continue to uphold the standards of technical excellence and ethical conduct embodied in the SES mission statement.

The enclosed Qualification Notice(s) and SES identification card are your permanent record of this achievement. This status is valid for the period shown on the renewal Qualification Notice.

Congratulations on your achievement and I wish you continued success in your future endeavors.

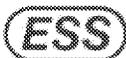
Sincerely yours,

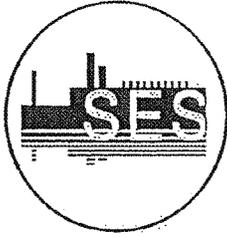
Peter R. Westlin
SES QSTI/QSTO Review Committee Chairman

- cc: Roy Owens, SES QSTI/QSTO Review Board Member
- Glenn England, SES QSTI/QSTO Review Board Member
- C. David Bagwell, SES QSTI/QSTO Review Board Member
- Karen D. Kajiya-Mills, SES QSTI/QSTO Review Board Member
- Peter S. Pakalnis, SES QSTI/QSTO Review Board Member
- Gail Westlin, SES QSTI/QSTO Review Committee Administrator

NEW. DO YOU APPROVE SES RELEASING INFORMATION, UPON REQUEST, ABOUT WHETHER YOU HAVE PASSED A METHOD GROUP EXAM? (The information released will be if you passed an exam and the date of the exam. This information is in support of ASTM D-7036-D.) YES NO IF YOU AGREE, PLEASE SIGN BELOW.

Signature: _____ Date: _____





Source Evaluation Society

P. O. Box 12124
Research Triangle Park
North Carolina 27709

August 24, 2011

Tiberiu Munteanu
Environmental Source Samplers, Inc.
436 Raleigh Street
Wilmington, NC 28412

Subject: Qualified Source Tester Application No. 2011-512
Qualification Notice - Manual Gas Volume Measurements and Isokinetic Particulate
Sampling Methods (exam date 2/4/11)

Dear Mr. Munteanu:

It is my pleasure to inform you that you have satisfied the requirements of the Source Evaluation Society Qualified Source Testing Individual program for group exam(s) listed above. As a member of the successful candidates in this SES program, you should be proud of this distinction within the source emissions testing community. I am confident that you will continue to uphold the standards of technical excellence and ethical conduct embodied in the SES mission statement.

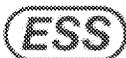
The enclosed Qualification Notice(s) and SES identification card are your permanent record of this achievement. This status is valid for the period shown on the Qualification Notice.

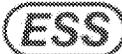
Congratulations on your achievement and I wish you continued success in your future endeavors.

Sincerely yours,

Peter R. Westlin
SES QSTI/QSTO Review Committee Chairman

cc: Roy Owens, SES QSTI/QSTO Review Board Member
Glenn England, SES QSTI/QSTO Review Board Member
C. David Bagwell, SES QSTI/QSTO Review Board Member
Karen D. Kajiya-Mills, SES QSTI/QSTO Review Board Member
Peter S. Pakalnis, SES QSTI/QSTO Review Board Member
Gail Westlin, SES QSTI/QSTO Review Committee Administrator





SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

LET IT BE KNOWN THAT

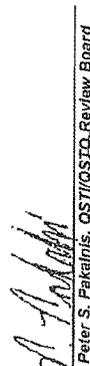
TIBERIU MUNTEANU

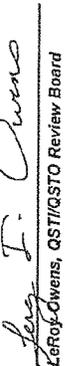
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

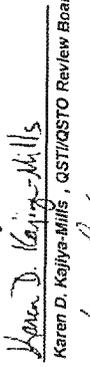
ISSUED THIS 15TH OF MARCH 2011 AND EFFECTIVE UNTIL MARCH 14TH, 2016

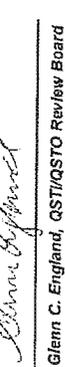

Peter R. Westlin, QSTI/QSTO Review Board


Peter S. Pakalnis, QSTI/QSTO Review Board

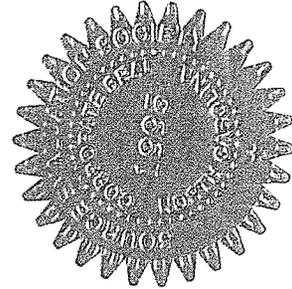

LeRoy Owens, QSTI/QSTO Review Board

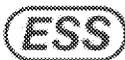

C. David Bagweff, QSTI/QSTO Review Board


Karen D. Kajiya-Mills, QSTI/QSTO Review Board


Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2011-512





SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

LET IT BE KNOWN THAT

TIBERIU MUNTEANU

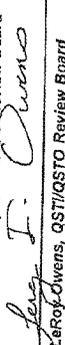
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

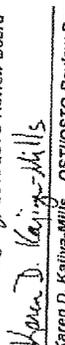
ISSUED THIS 24TH DAY OF AUGUST 2011 AND EFFECTIVE UNTIL AUGUST 23RD, 2016

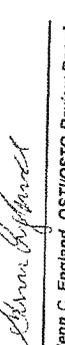

Peter R. Westlin, QSTI/QSTO Review Board

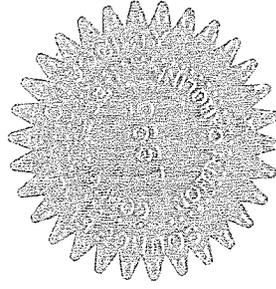

Peter S. Pakalnis, QSTI/QSTO Review Board


LeRoy Owens, QSTI/QSTO Review Board

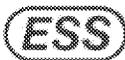

C. David Bagwaj, QSTI/QSTO Review Board


Karen D. Kajiya-Mills, QSTI/QSTO Review Board


Glenn C. England, QSTI/QSTO Review Board



APPLICATION NO. 2011-512



SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

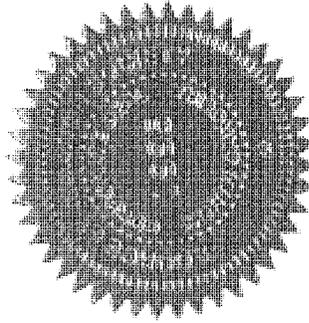
LET IT BE KNOWN THAT

TIBERIU MUNTEANU

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 31ST DAY OF JULY 2012 AND EFFECTIVE UNTIL JULY 30TH, 2017



Peter R. Westlin
Peter R. Westlin, QST/IQSTO Review Board

Peter S. Pakalnis
Peter S. Pakalnis, QST/IQSTO Review Board

LeRoy Owens
LeRoy Owens, QST/IQSTO Review Board

C. David Bagweff
C. David Bagweff, QST/IQSTO Review Board

Karen D. Kajiva-Mills
Karen D. Kajiva-Mills, QST/IQSTO Review Board

Glenn C. England
Glenn C. England, QST/IQSTO Review Board

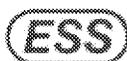
APPLICATION NO. 2011-512

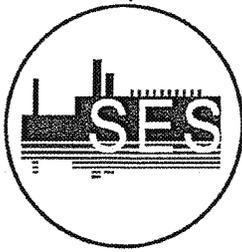


App. #
2011-512 **Source Evaluation Society**
P. O. Box 12124
Research Triangle Park, NC 27709-2124

TIBERIU MUNTEANU
Qualified Source Testing Individual

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS - Effective Aug. 24, 2011 through Aug. 23, 2015 (exam date: 2/4/11)
GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS
- Effective Mar. 15, 2011 through Mar. 14, 2016 (exam date: 11/19/10)
GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS
- Effective Jul. 31, 2012 through Jul. 30, 2017 (exam date: 1/20/12)





Source Evaluation Society

P. O. Box 12124
Research Triangle Park
North Carolina 27709

December 22, 2010

Charles A. Garner
Environmental Source Samplers
436 Raleigh St.
Wilmington, NC 28412

Subject: Qualified Source Tester Application No. 2009-306
**Qualification Notice - Manual Gas Volume Measurements and
Isokinetic Particulate Sampling Methods**
- **Manual Gaseous Pollutants Source Sampling Methods**
- **Gaseous Pollutants Instrumental Sampling Methods**
- **Hazardous Metals Measurement Sampling Methods**

Dear Mr. Garner:

It is my pleasure to inform you that you have satisfied the requirements of the Source Evaluation Society Qualified Source Test Individual program for group exam(s) listed above. As a member of the successful candidates in this SES program, you should be proud of this distinction within the source emissions testing community. I am confident that you will continue to uphold the standards of technical excellence and ethical conduct embodied in the SES mission statement.

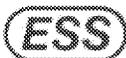
The enclosed Qualification Notice(s) and SES identification card are your permanent record of this achievement. This status is valid for the period shown on the Qualification Notices.

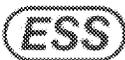
Congratulations on your achievement and I wish you continued success in your future endeavors. Please see attached a permission letter if you wish to have your information posted on the SES web site.

Sincerely yours,

Peter R. Westlin
SES QSTI/QSTO Review Committee Chairman

cc: Roy Owens, SES QSTI/QSTO Review Board Member
Glenn England, SES QSTI/QSTO Review Board Member
C. David Bagwell, SES QSTI/QSTO Review Board Member
Karen D. Kajiya-Mills, SES QSTI/QSTO Review Board Member
Peter S. Pakalnis, SES QSTI/QSTO Review Board Member
Gail Westlin, SES QSTI/QSTO Review Committee Administrator





SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

LET IT BE KNOWN THAT

CHARLES A. GARNER

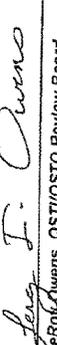
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

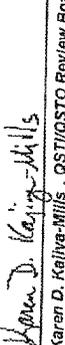
ISSUED THIS 22ND OF DECEMBER 2010 AND EFFECTIVE UNTIL DECEMBER 21ST, 2015

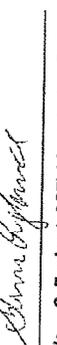

Peter R. Westlin, QSTI/QSTO Review Board


Peter S. Patakinis, QSTI/QSTO Review Board

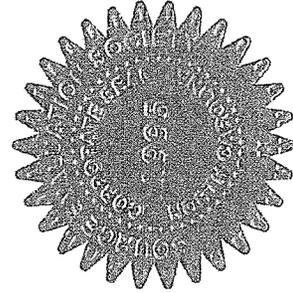

Leroy Owens, QSTI/QSTO Review Board

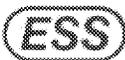

C. David Bagweff, QSTI/QSTO Review Board


Karen D. Keljya-Mills, QSTI/QSTO Review Board


Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2009-306





SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

LET IT BE KNOWN THAT

CHARLES A. GARNER

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

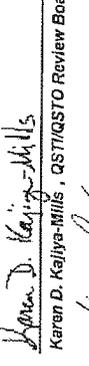
MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

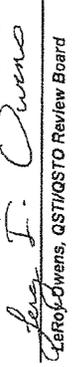
ISSUED THIS 22ND DAY OF DECEMBER 2010 AND EFFECTIVE UNTIL DECEMBER 21ST, 2015

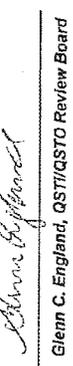

Peter R. Westlin, QSTI/QSTO Review Board


C. David Bagweff, QSTI/QSTO Review Board

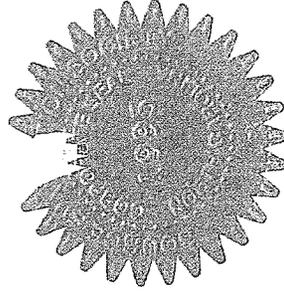

Peter S. Pakalnis, QSTI/QSTO Review Board

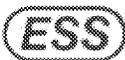

Karen D. Keljya-Mills, QSTI/QSTO Review Board


Gary J. Owens, QSTI/QSTO Review Board


Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2009-306





SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

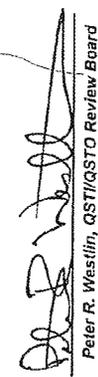
LET IT BE KNOWN THAT

CHARLES A. GARNER

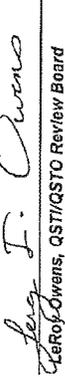
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

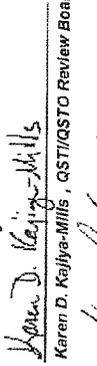
ISSUED THIS 22ND DAY OF DECEMBER 2010 AND EFFECTIVE UNTIL DECEMBER 21ST, 2015

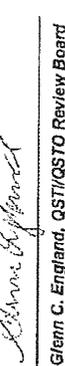

Peter R. Westlin, QSTI/QSTO Review Board

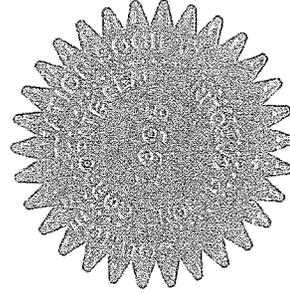

Peter S. Pakalnis, QSTI/QSTO Review Board


Leo F. Owens, QSTI/QSTO Review Board

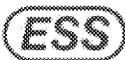

C. David Bagweff, QSTI/QSTO Review Board


Karen D. Kajiye-Mills, QSTI/QSTO Review Board


Glenn C. England, QSTI/QSTO Review Board



APPLICATION NO. 2009-306



SOURCE EVALUATION SOCIETY



Qualified Source Testing Individual

LET IT BE KNOWN THAT

CHARLES A. GARNER

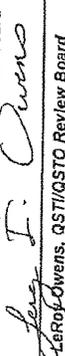
HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

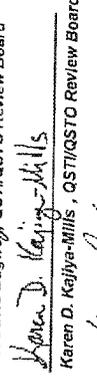
ISSUED THIS 22ND DAY OF DECEMBER 2010 AND EFFECTIVE UNTIL DECEMBER 21ST 2015

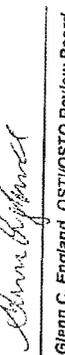

Peter R. Westlin, QSTI/QSTO Review Board


Peter S. Pakalnis, QSTI/QSTO Review Board

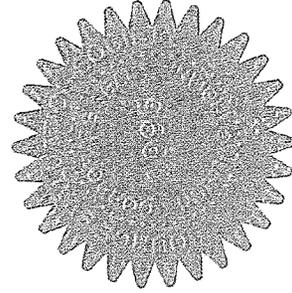

LeRoy Owens, QSTI/QSTO Review Board

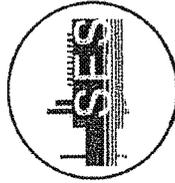
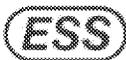

C. David Bagweff, QSTI/QSTO Review Board


Karen D. Kajiya-Mills, QSTI/QSTO Review Board


Glenn C. England, QSTI/QSTO Review Board

APPLICATION NO. 2009-306





Source Evaluation Society
P. O. Box 12124
Research Triangle Park, NC 27709-2124

CHARLES A. GARNER

Qualified Source Testing Individual

- MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS - Effective December 22, 2010 through December 21, 2015
- MANUAL GAS SOURCE SAMPLING METHODS
 - Effective December 22, 2010 through December 21, 2015
- GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS
 - Effective December 22, 2010 through December 21, 2015
- HAZARDOUS METALS MEASUREMENT SAMPLING METHODS
 - Effective December 22, 2010 through December 21, 2015